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NEW ZEALAND JOURNAL OF Agriculture

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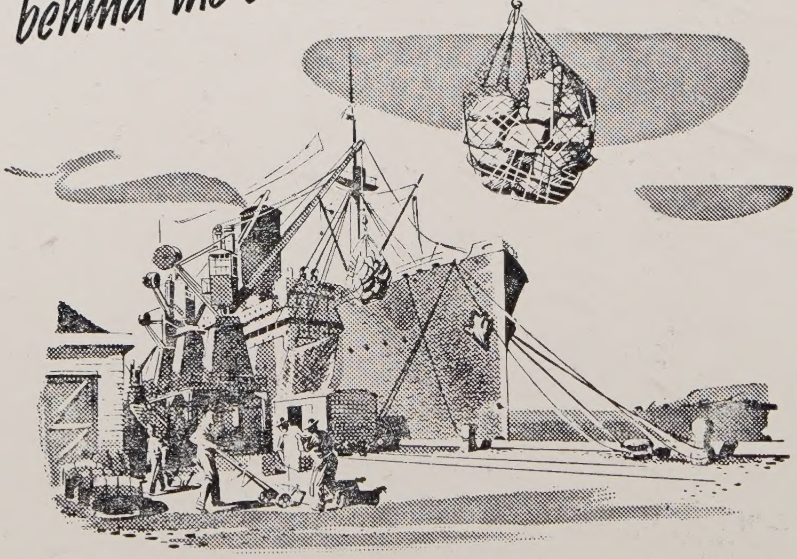

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This Month's Cover

Since the first application of lime to grassland in New Zealand was made in Southland in 1890 lime usage has risen to the point where more than half the land topdressed in the Dominion today is limed. This month's cover, which has been reproduced from a colour photograph by Sparrow Industrial Pictures Ltd., shows part of a large stockpile of lime which has been formed at Taonui, near Feilding, and which is the first of a number to be established in some farming districts served by railway. By being built up during the slack period of the year these stockpiles have the advantage of assuring local farmers delivery of lime when it is needed.

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New Zealand Department of Agriculture

HEAD OFFICE:
Dominion Farmers' Institute Building,
Featherston Street, Wellington.

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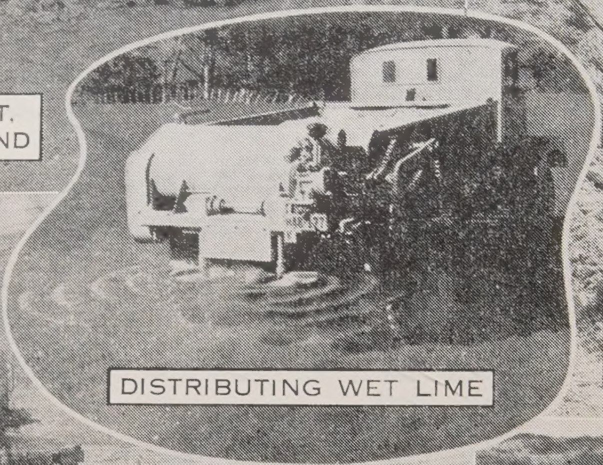
Lime

LIMESTONE DEPOSIT, BALFOUR, SOUTHLAND


DISTRIBUTING WET LIME

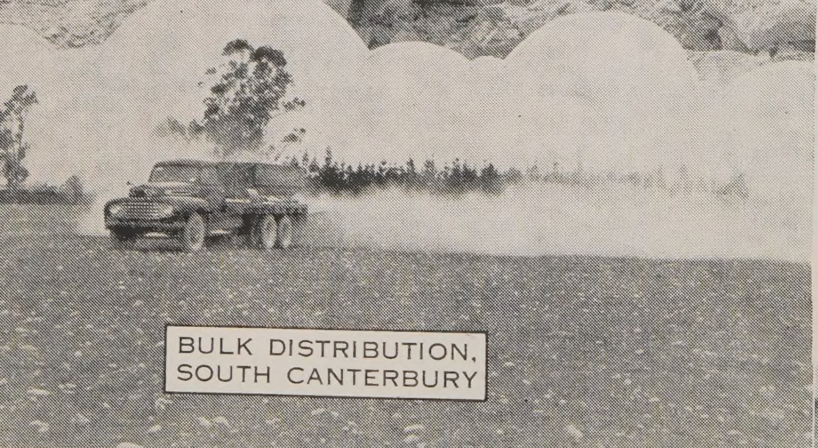
LIMEWORKS, WAIKARI, NORTH CANTERBURY

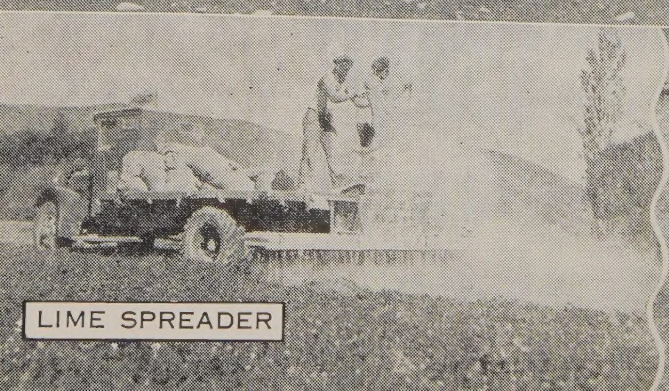
"ROOTING" OF LIME

TOPDRESSING BY BLOWER

Lime, which today plays so important a part in pasture production, has a relatively short history of widespread use in New Zealand. In 1931 about 171,000 tons were applied to soils in the Dominion; in 1947 the figure had risen to 1,021,000 tons, and for 1950 the estimated tonnage is 1,350,000. Present indications are that, with the latest methods of handling, there will be a demand for still greater annual tonnages.

[*Photographs by National Publicity Studios and E. F. Neilson.*


BULK DISTRIBUTION, SOUTH CANTERBURY


LIME SPREADER

DAIRY PASTURES, HAMILTON

A PROGRESSIVE LIME INDUSTRY

THE great increase in the carrying capacity and production of our farmlands during the past 25 years has been closely linked with an ever-widening appreciation of the value of lime applied to our soils. Though limeworks were in existence in Otago and Southland 70 years ago, transport difficulties imposed restrictions on cartage and farmers in general were slow to realise the value of lime on their pastures. Not until about 1920 was there general acceptance of the fact that crushed carbonate of lime gave better value for money than burnt or slaked lime. With the improvement of transport facilities wider distribution of lime was possible, but as late as 1931 only some 170,000 tons were used for agricultural purposes in a year. In the next 16 years there was a remarkable increase in lime usage, about 1,020,000 tons being used in 1947 alone. At that stage, however, an impasse was reached which temporarily prevented any further great expansion.

Our railway system had become unable to cope with the increasing demand, particularly during seasonal peaks. The system of free railage for 100 miles, which had survived for about 50 years, had become outmoded by the development of motor transport, and in addition it was being abused by the overlapping of long rail hauls. Farmers themselves could handle the tonnages used 20 or even 10 years ago, but further increases beyond the tonnages now being produced are beyond their capacity.

Introduced in 1947 in place of free railage, and revised in 1949 and again in 1950, the Lime Transport Assistance scheme gave more equitable and effective help to farmers using both road and rail transport. It practically eliminated the overlapping of long rail hauls, and transferred the short-haul traffic from rail to road. Stockpiles are now appearing, enabling more lime to be carried during the comparatively slack months of rail haulage. New limeworks have been established in areas previously served only by long rail hauls. Several mobile crushing plants are working limestone deposits in areas remote from railways. Lime-carting and lime-spreading contractors have emerged, using highly specialised equipment.

Concurrently with these means of making more effective use of our transport facilities have come numerous improvements in methods and equipment for extracting and processing the stone and spreading the finished product. At many works the "rooting" principle of extraction has superseded the old method of quarrying with explosives. It has been found that with some types of lime satisfactory separation of the coarse fragments from the fines can be achieved by passing the material over a stationary inclined screen. The introduction of spreading vehicles designed to handle undried lime has led to the elimination of the heat drying process at some works. About one-third of all lime going out directly from works to farm, and a rapidly expanding proportion of the railed lime, are now going out unbagged. Better spreading vehicles and blower-type distributors are enabling the liming of areas previously regarded as inaccessible.

Many farmers may be surprised to learn that it has never been found necessary to enact any legislation about lime. As long as the regulations concerning quarrying are observed, any person is free to produce and market lime. The standards of quality and grinding are maintained only through the operation of the Lime Transport Assistance scheme. Samples are taken for analysis at frequent intervals from all works participating in the scheme, and in extreme cases of unsatisfactory products the subsidy is withdrawn. The usual procedure, however, is for an officer to visit the works and discuss the problems with the miller. In appropriate cases experts from the Geological Survey Division of the Department of Scientific and Industrial Research are called in to see whether better-quality stone can be obtained.

Field officers of my Department never tire of emphasising to farmers the virtues of lime applications in many circumstances, but frequently the limiting factor in practice has been availability. However, a study of all the factors I have mentioned allows me to draw this encouraging broad picture: After remaining at near the 1,100,000-ton mark for 2 years, lime usage is now soaring again—to an estimated 1,350,000 tons for 1950. The farmer toiling to empty bags of lime into a hopper fitted to the back of a horse-drawn vehicle is giving way to the specialist who makes light work of spreading much greater quantities over more difficult country. During a period when prices in general have risen sharply, lime prices have remained fairly constant. The lime industry is now able to produce some 2,000,000 tons annually.

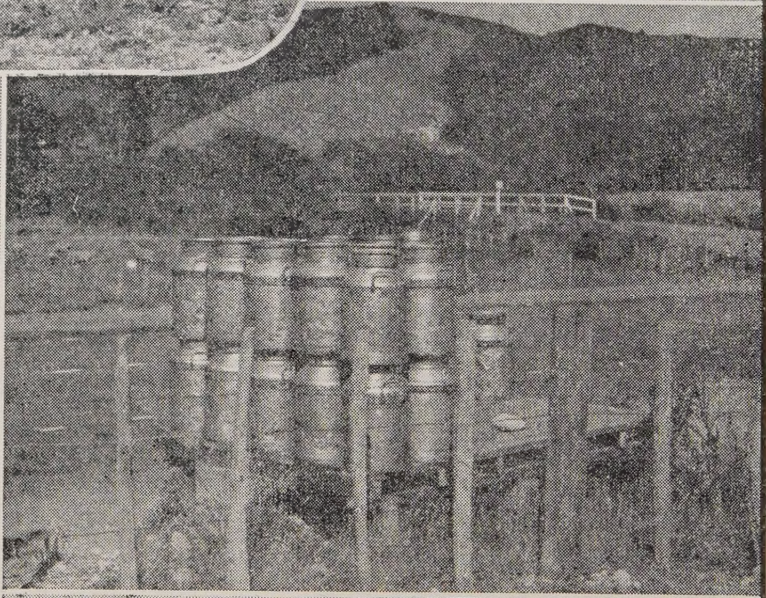
In the lime industry we see a splendid example of private enterprise at its best. Here is no vast industrial combine paying experts to exploit its resources, but more than a hundred separately owned works, operated by individuals, partners, small companies, and co-operative groups. Almost without exception they are competing freely, and yet in a splendid spirit of co-operation, eager to effect improvements and to exchange ideas. Behind them is a host of "backyard inventors", applying themselves to the self-imposed tasks of devising better machinery. Engineering firms are now developing the ideas of men who have produced something new for the lime industry, and are equipping the industry for the cheap, expeditious, and effective handling of still greater tonnages of lime.

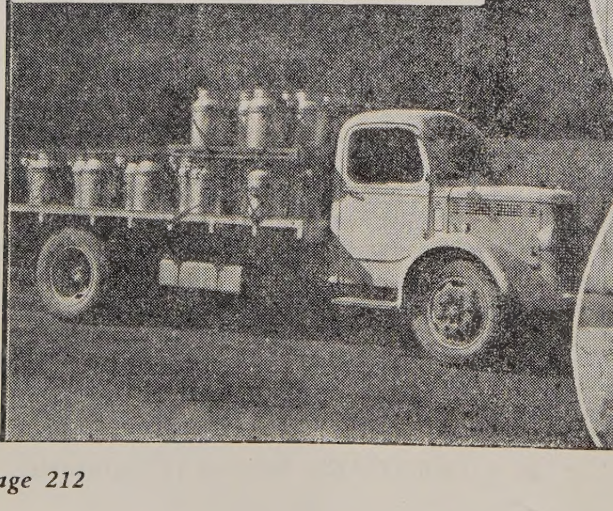
Lime cannot take the place of phosphate, but the various forms of phosphate can be of maximum effectiveness only if the lime status of the soil is satisfactory, and most of our soils need the addition of this material. Therefore it is a comforting thought that at a time when the world shortage of sulphur is causing much concern about our phosphate supplies we are free from any major worry about lime. Deposits of good-quality stone are fairly well distributed throughout the country, and the industry has shown that it is sufficiently progressive to be able to meet any demands that may be made on it.

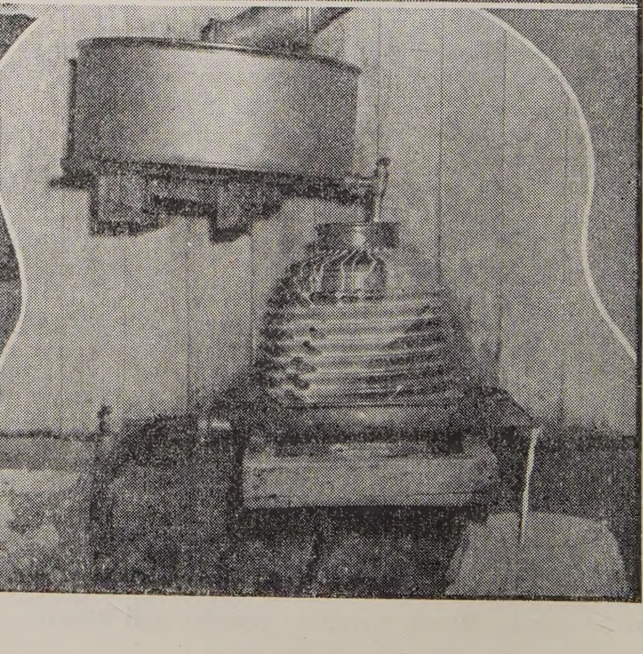
K. J. HOLYOAKE, Minister of Agriculture.

HOW MILK IS SPOILT

Above—The temperature of water drawn from a creek in this fashion is likely to be so high as to make it useless for cooling milk. Right- The value of milk cooling is lost if care is not exercised during its storage and transport. Milk left on a stand in sunshine develops a tallowy flavour and becomes warm, so speeding up bacterial growth. Lower left—Even if milk is protected on the stand, it can still be spoilt by exposure to sunshine on a lorry. Lower right—A very poor arrangement of vat and cooler. The cooler is not level and the whole layout is too close to the dairy wall, making cleaning difficult. Wooden stands are not recommended, as they become insanitary, and buckles in the hose should be avoided.







The Cooling of Milk for City Supply

EFFICIENT cooling is one of the most important factors in producing good-quality milk for city supply. In New Zealand large quantities of milk are spoilt each year by lack of efficient cooling on farms before the milk starts its journey to treating houses or depots. In this article N. M. Wadsworth, Inspector of Stock and Dairies, Department of Agriculture, Christchurch, offers advice on installing cooling equipment and describes some faults commonly found when complaints of poor cooling are being investigated.

UNLESS a milk cooler is of suitable size and is installed correctly its object is defeated. The more important aspects of milk cooling may be summarised as follows:—

The cooler must be large enough for the work it has to do. Sizes of coolers were discussed on page 269 of the "Journal" for March, 1950, in an article by T. A. Coulter.

The water should flow directly from well to cooler and the supply should be connected to the bottom of the cooler.

The quantity of water required is at least 5 times the amount of milk to be cooled. The inlet pipe should be not less than ¾in. and the outlet pipe not less than 1in. in diameter.

A vat or separator bowl placed under the milking-machine releaser enables the milk flow to be regulated over the cooler. In vats over the larger coolers 2 or even 3 taps may be used to spread the flow of milk.

While it is being cooled milk should be spread evenly over the cooler surface with a bottle brush kept perfectly clean, used only for this purpose, and sterilised in boiling water before use.

The cooler must be installed level. Suspending a cooler on chains or wires from the dairy ceiling is not very satisfactory, as the chains or wires get out of adjustment, causing the cooler to hang off level.

Ensuring Evenness of Test

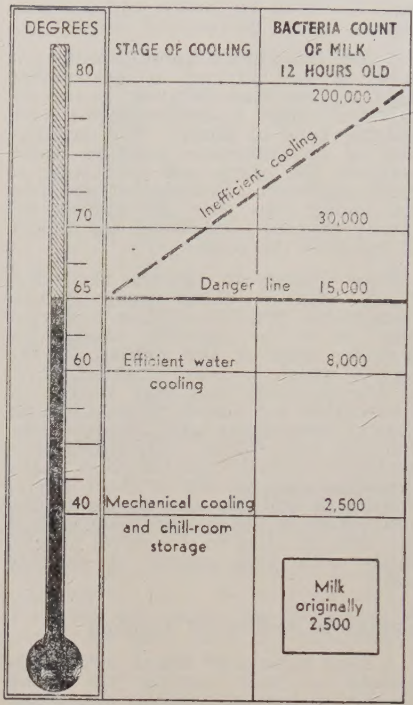
A spreader tray fitted to the bottom of the cooler enables a number of cans to be filled at one time, thereby distributing the milk flow evenly and ensuring an even bulking of milk, which in turn gives an even butterfat content of the whole of the supply.

A recent amendment to the Sale of Food and Drugs Act, 1947, provides that a sample taken from one can of milk shall be deemed to be a sample from the bulked or whole supply. Therefore, to protect himself against the possibility of being prosecuted for one low-testing can of milk, a producer should see that all the milk from any one milking is evenly mixed.

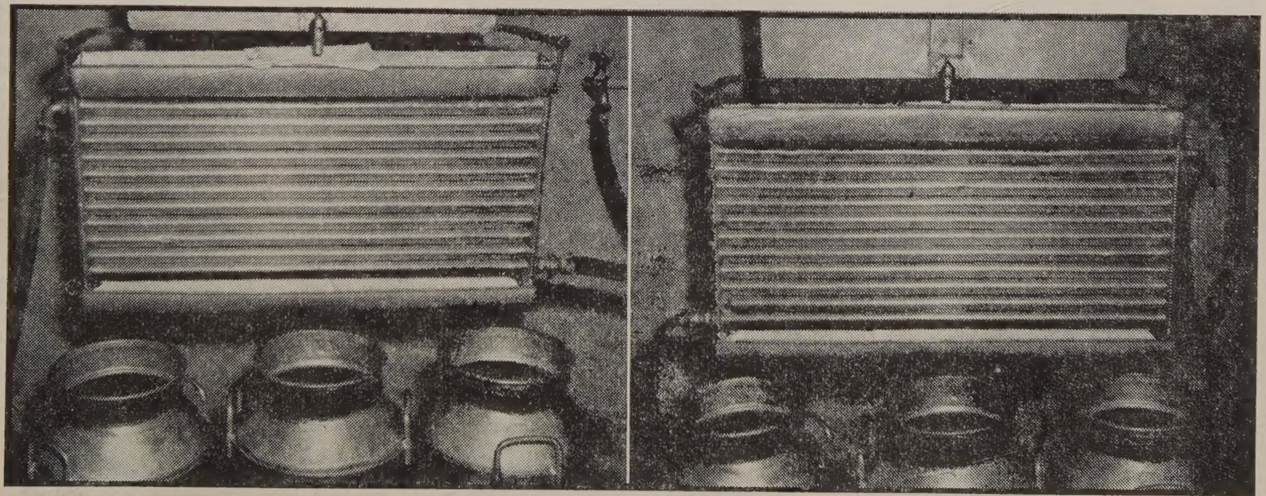
Pumps and Fittings

In some districts a sufficient flow of water for cooling can be obtained directly from artesian wells, but other districts are not so fortunate and suitable pumps are essential for this purpose. Where it is necessary only to raise the level of a good artesian flow rotary booster pumps have proved very suitable, but where the level of water is some distance from the surface of the ground suction pumps appear to give the best results.

How Bacteria Count Increases with Temperature



Pressure pumps are also finding favour with farmers. Where this type of pump is used water should be turned on to the cooler at least ¼ hour before cooling is begun, especially if the pressure pump is some distance from the dairy. This is most important, especially in hot weather, as tests have shown that water held in pressure tanks frequently rises to a temperature as high as 75 degrees.



The water inlet to a cooler should be at the bottom, as on the left, and not at the top, as on the right. When water enters at the bottom the coldest milk as it leaves the cooler passes over the coldest water as it enters the cooler, and the cooler **barrels must be full of water and not only partly full.**

COOLING MILK . . .

In all other cases turning the water on at least 5 minutes before cooling is begun is a wise precaution, as any leak in the cooler is then detected more easily. Even new coolers have been found to be faulty, and all milk coolers should be checked frequently.

Before installing a pump a milk producer is well advised to seek advice from a pump manufacturer, as certain data are needed to determine the most suitable type of pump. The installation of an automatic pressure valve between the pump and the cooler is most important. Pressure of water to the cooler can then be maintained evenly, thereby eliminating the danger of bursting the cooler.

Hose fittings to coolers are often fitted with a sharp bend, which reduces the flow of water, or in such a way as to be directly above the spreader tray at the bottom of the cooler, which is most unsatisfactory, as the slightest leak may lead to a prosecution for added water in milk. Leaky connections also waste water valuable for cooling. All water connections should be carried clear of the spreader tray by fitting short barrel nipples of suitable size in the intake and outlet of the cooler; hose fittings can then be fitted to the barrel nipples easily with pipe sockets of suitable size.

Causes of Inefficient Cooling

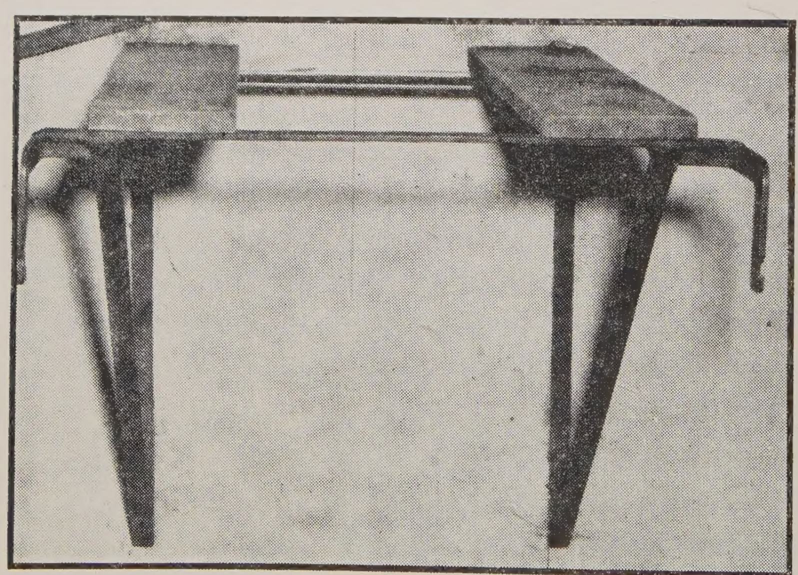
A fault commonly found when complaints of poor cooling are being checked is that both cooler and water supply are too small for the work. It has also been found that worn-out pumps incapable of doing the work required are in use or have been installed. The water level of the well may have dropped, necessitating the installation of a more efficient pump and the cleaning out or resinking of the well bore.

The interior of a modern city-supply dairy with loading stage, louvred ventilation, and pressure pump. A water pipe is used as a can rack.

Another common cause of inefficient cooling is increasing the size of the herd or doubling up the milking machines since the original cooler was installed.

Every milk producer should have a reliable dairy thermometer in the dairy to enable a careful check to be kept on the temperature of the milk. If it is found that milk is not being cooled to within 2 degrees of the temperature of the water, the cause should be investigated. Water for cooling milk should be not warmer than 60 degrees F. and preferably cooler, as it is most desirable to cool milk to as nearly as possible 60 degrees, which in summer is as low as can be expected with water cooling. This temperature retards bacterial growth, helps to expel feed flavours, and assists toward ensuring a good-quality, palatable milk. Therefore tank water, creek water, and water of high temperature such as that from town water mains are useless for cooling milk.

In some districts the temperature of the water available is so high that water cooling is impossible. In these cases the only alternative is mechanical cooling, which is favoured in quite a number of districts. However, before a milk producer commits himself to the expense of installing a refrigerating unit he should discuss the subject with the Inspector of Stock for his district, as certain formalities must be observed.



A good combination of vat stand and cooler bracket which allows easy dismantling of the cooler for cleaning.

Keeping Milk Cool

After being cooled milk should be stored in a cool, sweet, well-ventilated place, preferably in the dairy away from direct sunshine. Modern milking sheds are constructed with a holding stage in the dairy and a loading stage outside, making the holding and loading of milk more convenient and efficient.

Milk exposed to sunshine on stands and lorries develops a tallowy flavour and becomes warm, so speeding up bacterial growth. Therefore the value of cooling is lost if proper care is not taken in the storage of milk at the dairy and in its transport to the depot. Plunging milk with a good metal plunger before dispatching it to the depot is also beneficial, as it mixes the fat thoroughly into the milk and helps to prevent churning in transport.

Keeping a careful check on cooling methods is in a dairy farmer's own interests, as clean, properly cooled milk helps materially to protect him against a low reductase test or, worse still, the rejection of the milk supply by the treating station.

APPARATUS FOR LOW-PRESSURE STEAMING OF NURSERY SOIL

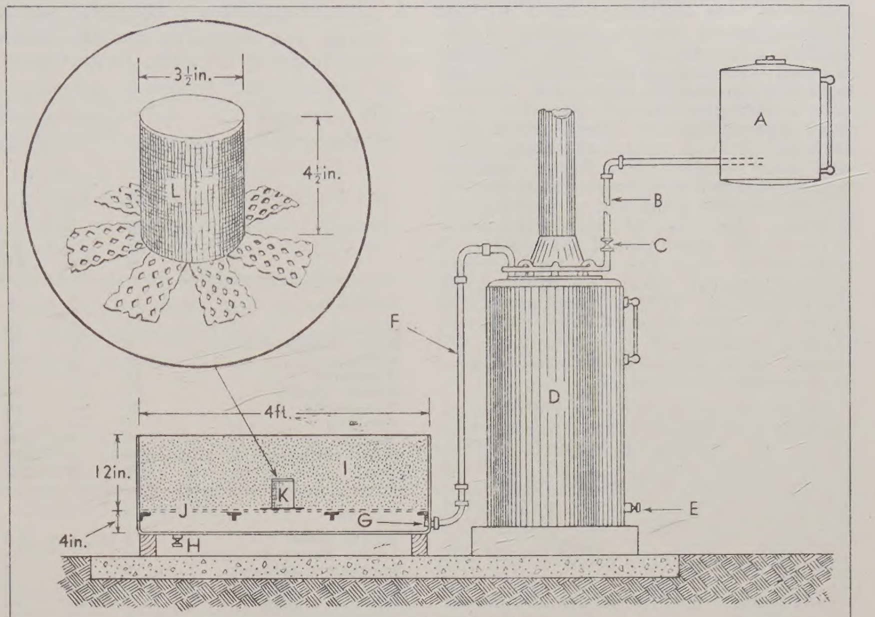
A LOW-PRESSURE steaming apparatus capable of disinfecting sufficient nursery soil for the requirements of commercial growers is described in this article by H. Jacks and J. A. Hunter, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland. The apparatus is safe to use and requires little attention during operation.

THE components of this low-pressure steam steriliser are a boiler, a fuel-supply system, and a soil-box assembly.

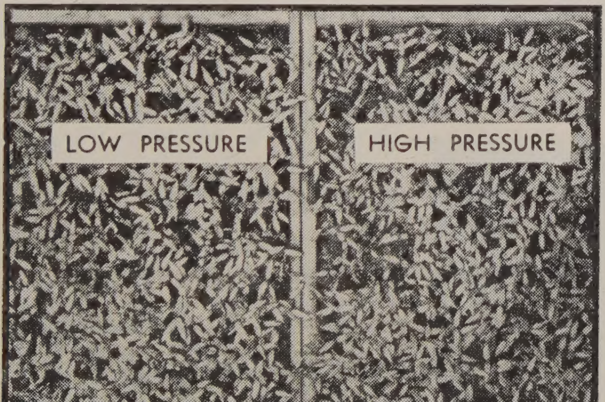
Boiler: Constructed of heavy steel, the boiler is mounted on a refractory lined base. It is equipped with a 12ft. flue with flue top, a set of gauge glass mounts with blowdown cock, a water inlet valve, a hydrostatic head tank with fittings, down draughts leading to three plate burners, and a feed pipe of 1in. gauge supplying steam to the soil box. Each burner, supplied by a drip-feed valve, fires down a tube into a refractory lined fire box at the bottom, and the hot gases return through another set of tubes to the smoke box and funnel. The boiler is suitable for generating steam at 1lb. working pressure per square inch and an hourly output of heat equivalent to 60,000 B.Th.U. Steam is available 20 to 30 minutes from time of lighting.

Fuel supply system: A 10-gallon oil tank with gauge, mounted at adequate height to allow for gravity flow, is provided with 12ft. of pipe, connections, and a stop valve. The lower end of the oil pipe is semi-circular in shape. It is fitted on the boiler and equipped with three valves supplying the drip-feed vaporising-type burners.

Soil-box assembly: The soil-box assembly consists of a 4ft.-square wooden box with steel lining (3/16in. plate) mounted on wooden blocks 4in. high. The box is 16in. deep and provided with steam inlet and a cock for draining condensed steam. A wire-mesh platform made of three sections is supported within the box 4in. from the bottom. Thus the soil-container proper is 12in. deep and capable of holding approximately ½ cu. yd. of potting soil when filled to a level 1in. from the top. To ensure satisfactory heating throughout the soil volume a funnel acting as a steam duct is placed in the centre of the wire-mesh platform.



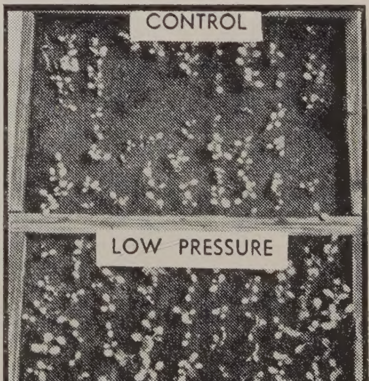
Details of a low-pressure steam plant for soil disinfection. A—Oil tank. B—Oil feed line. C—Stop valve. D—Boiler. E—Cold-water feed. F—1in. feed pipe supplying 1lb. pressure. G—Steam injected through 1in. socket. H—Drain cock. I—Soil box. J—Three wire-mesh sections resting on angle irons. K—Perforated steam funnel (inset is a detail of K). L—Scrim.



Emergence and growth of tomato seedlings in soil disinfected by high- and low-pressure steam.

The funnel is constructed from a perforated steel cylinder measuring 3½in. in diameter and 9in. in length. The metal cylinder is cut into eight strips to half its length, these being bent to form a stable base. The top is sealed by a 20-gauge metal disc and the sides are covered with hessian. The finished duct is 4½in. high.

The boiler is started by inserting lighted paper into downdraughts leading to the burners after the fuel system has been opened. In the case of moist atmosphere it is advisable to dry the air in the flue by holding lighted paper through a port provided for the purpose. After being filled the soil box should be covered with a tarpaulin or sacks.



Emergence and growth of lettuce seedlings in low-pressure steam-disinfected soil and untreated soil.

Recording of Temperatures

Temperatures, recorded with a Cambridge dial thermometer, were taken at four points of a square within the box at approximately 5in. distance from the walls, as well as in the centre. Records, at 2in. depth, were taken at

SOIL STEAMING . . .

regular intervals and when the temperature reached 200 to 210 degrees F. steaming was continued for a further 10 minutes to ensure heating of the surface layer of soil. Further readings showed residual temperatures to be between 180 and 200 degrees F. 20 minutes after steam was cut off. The complete operation was timed when carried out with a cold and warm plant and as a result it was found that the figures given below ensure satisfactory disinfection of ½ cu. yd. of potting soil without the use of a thermometer. With a cold apparatus it takes 60 to 80 minutes to raise the soil temperature to the required level and to complete the procedure. With a warm apparatus (that is, a second lot of soil), however, it only requires 30 to 40 minutes. Oil consumption per hour proved to be ¾ to 1 gallon of diesel oil.

Different soil mixtures were used, including one supplied by a nurseryman from an Auckland suburb. Tests showed little changes in pH and the normal increase in nitrogen, varying in amount with the different soils tested, did not affect emergence or growth of seedlings. Seeds of tomato, lettuce, and cauliflower were sown in soil that 24 hours previously had been thus disinfected. Emergence and growth of seedlings proved to be satisfactory and the treatment also gave good control of damping-off and weeds. A comparison with soil disinfected by high pressure showed that low-pressure steaming gave equally satisfactory results. The results of these tests proved that the apparatus worked efficiently and was satisfactory for disinfection of the quantity of soil indicated.

Fruit Crop Estimates for January, 1951

THE following estimates of the fruit crop for January, 1951, in 000's of bushel cases, are provisional and revised monthly for the period November to March and are summarised from information supplied by field officers of the Horticulture Division, Department of Agriculture.

FRUIT	DISTRICT									
	Auckland	Gisborne	Hawkes Bay	Manawatu Wanganui	Wairarapa	Nelson	Marlborough	Canterbury North Otago	Central Otago	Total
APPLES—										
Ballarat	47	5	70	2	1	8	3	9	1	146
Cox's Orange Pippin ..	8	3	50	1	1	131	13	15	11	233
Delicious	23	6	85	1	5	187	28	28	40	403
Dougherty	17	5	55	—	—	24	2	—	—	103
Granny Smith	63	2	80	2	3	84	2	4	4	244
Gravenstein	20	—	30	—	—	62	1	1	1	115
Jonathan	9	—	45	—	1	253	24	18	32	382
Sturmer	3	4	160	5	15	354	27	52	32	652
Other varieties	88	3	126	3	6	146	19	53	48	492
Total	278	28	701	14	32	1249	119	180	169	2770
PEARS—										
Beurre Bosc	5	1	3	—	—	9	—	—	—	18
Louise Bonne de Jersey .	1	—	15	—	—	—	—	—	1	17
Packham's Triumph ..	5	—	4	—	—	3	—	—	—	12
P. Barry	3	1	10	—	—	4	—	1	—	19
W. B. Chretien	13	—	45	—	—	36	—	4	8	106
Winter Cole	2	1	70	—	2	34	1	7	3	120
Winter Nelis	—	1	35	—	1	9	—	3	5	54
Other varieties	14	—	9	2	—	12	1	10	4	52
Total	43	4	191	2	3	107	2	25	21	398
OTHER FRUITS—										
Peaches	50	3	238	1	—	54	6	9	68	429
Apricots	1	—	4	—	—	1	—	12	136	154
Nectarines	—	—	20	—	—	2	1	—	18	41
Plums	43	5	51	1	1	13	2	9	29	154
Cherries	—	—	1	—	—	—	2	2	12	17
Quinces	1	—	8	—	—	10	—	—	1	20

FIRE
PRECAUTIONS

IN some parts of New Zealand, soil and vegetation become very dry in hot weather and with every summer comes the dread of fire, especially to farming and forestry people. Most years bring sorry news of the toll levied by fires—grass, hedges, houses, crops ready to harvest, and forests damaged or destroyed, and sometimes stock and even people trapped without hope of escape. Unlike the plains and flats, burnt-out hills are left easy victims to erosion, one of the worst enemies of food production. Everyone should keep in mind the dangers of leaving fires unattended or unextinguished, of flinging cigarette butts away without first making sure they are dead, and of leaving broken glass above ground to catch the sun.

Farm fires are caused at times by carelessness, by the taking of known risks, and by the lack of preparation before burning. The danger of them occurring can be reduced by attention to these precautions:—

Leave no fires unattended or not extinguished.

Bury tins or broken glass.

Throw away only dead cigarette butts.

Fit extension exhausts to tractors during very dry periods.

Plough sufficiently wide firebreaks before burning.

Back burn wherever possible. If stubble or tussock must be burnt off, choose a day of very little wind and when neighbours are available should an emergency develop.

In an emergency get to the nearest telephone as quickly as possible, because a bad fire with, for example, a north-wester blowing in Canterbury can mean loss of lives as well as of the results of years of work.

—*J. N. WHYTE, Farm Machinery Instructor,*
Department of Agriculture, Dunedin.

Cleaner Mixture for Use on Milking Machines

By W. G. WHITTLESTON, Physical Chemist, Department of Agriculture Animal Research Station, Ruakura.

THE following article describes the results of recent experiments at Ruakura on the cleaning of milking equipment. During a recent visit overseas the writer saw new methods in use in America which appeared to have advantages over the usual New Zealand methods. The experiments to be described show that by the application to the problem of cleaning the milking machine of modern wetting agents referred to by G. M. Moir in an article in the February "Journal", good results may be obtained without the use of highly alkaline or caustic solutions. These preliminary trials also show that a suitable mixture of alkalis and wetting agents may be formed into attractive pellets of uniform size so that the detergent is available in an already-measured form.

ONE pellet to 3 gallons of water gives the correct strength of solution. These pellets are not corrosive or caustic and may be handled safely. Because of its mild action, the detergent may be used for domestic purposes, such as dish washing or the cleaning of over-alls, with no unpleasant effects on the users' hands.

Before describing the results of experiments the principles involved in modern cleaning techniques should be discussed. This will be done by defining some of the most important terms used in this field of applied science.

Wetting Agents

Wetting agents are substances which cause water to spread as a film over surfaces which will not normally accept such a film. A greasy plate is a good example. Soap is a mild wetting agent; a greasy dish dipped in water takes up only a few droplets, but when the same dish is dipped in a soapy solution a uniform film is formed. Similarly substances like the alkyl sulphates or the alkyl polyethers will make water spread on the most resistant of surfaces such as fatty or greasy metal.

Detergents

Simply to wet the surface is not sufficient to clean an article. A cleaner must remove the greasy film of "dirt" or "soil". Wetting agents in higher concentrations will clean a surface; the molecules of the agent pull themselves into the crevices and under the films of dirt, surround the fatty material, and take it off into the solution, where it is suspended as fine droplets. In this process the detergent is used up, as the molecules remain surrounding the dirt particles, so keeping them in suspension. This means that a very dirty job needs more detergent than a cleaner one.

In addition to the organic wetting agents referred to, alkaline substances such as soda ash, sodium meta-silicate, caustic soda, etc., are detergents. To some extent these substances work chemically by turning fatty substances into soaps which then help in the cleaning process. The soaps and the sodas are not good "rinsers"; that is, they do not run off the surface to leave a thin, clear film. Meta-silicate, trisodium phosphate, and the organic wetting agents are good rinsers and leave polished metal or glass surfaces in sparkling condition.

"Builders"

The properties of many wetting agents may be improved by the addition of a simple inorganic salt such as sodium chloride (common salt) or sodium carbonate (soda ash). Compared with the wetting agent the salt or "builder" as it is called is cheap, so that the most economical way to use a wetting agent is in a salt solution. This also applies to soaps, and common soap powders contain soda ash as a builder. As an alkaline solution when hot is useful in dispersing fats and in killing bacteria, it is logical to use soda ash (which is also cheap) as a builder in a detergent for milking machines.

"Sequestering" Agents

Many waters are hard, that is, they contain salts of calcium and magnesium. These salts react with carbonates or with soaps to form a scum or precipitate. By adding certain complex phosphates (sodium hexametaphosphate or tetrasodiumpyrophosphate) it is possible to put the calcium or magnesium out of action and still retain a clear solution. The calcium or magnesium is "sequestered" by the phosphate molecule. This action results in a soft water.

Tablets of Ruakura detergent mixture. Each tablet is sufficient for 3 gallons of solution.

Anti-corrosion Agents

It is important when cleaning tinned metal to avoid corroding the surface. Acid cleaners are impractical because of the ease with which they attack tin. Strong alkaline solutions also attack tin as the farmer knows if he puts caustic soda into a bucket before adding water. One of the most useful anti-corrosion substances is sodium meta-silicate, which is also a good detergent and has good rinsing properties.

Mixture Better than Simple Solution

There is evidence that a more efficient action is obtained by using a mixture of wetting agents instead of a simple solution. In other words, it is sometimes better to use less than half as much of each of two wetting agents than to use either separately. A case in which this applies is the mixing of a non-ionic detergent of the polyether type with an alkyl sulphate. Such a mixture is the most economical way in which to use these materials for some purposes.

General-purpose Dairy Cleaner

From the definitions and descriptions given it is possible to design a general-purpose dairy cleaner. Its requirements are:—

Alkalinity, to kill bacteria and to help to remove fat and casein deposits.

Wetting properties, to enable the solution to penetrate fine crevices.

Detergency, to remove all kinds of dirt from metal and rubber surfaces.

Non-corrosive action, to avoid damage to tinned surfaces.

Water-softening ability, to deal with calcium and magnesism salts and to avoid scum formation.

Slight frothiness: A slight froth is a help in getting a good scrubbing action for cleaning tubes.

Good rinsing ability: This ensures that metal surfaces are left clean and shiny.

All of these properties may be obtained from a mixture of sodium carbonate, sodium meta-silicate, sodium hexametaphosphate, an alkyl sulphate, and an alkyl polyether. Such a mixture has two further advantages which are not directly related to the cleaning properties:—

1. The solution is "buffered" so that it retains its alkalinity in acid water. In this respect it is preferable to caustic soda in that while being milder in reaction than caustic soda it retains this property in water, the acidity of which is such that caustic soda is reduced in alkalinity to a point lower than that of the detergent.
2. The components may be formed into a tablet which, because of the presence of wetting agents, breaks down quickly in hot water. Such a tablet simplifies measuring and packing of the material.

A number of mixtures have been tried and the mixture which has been found to have the best all-round properties, Ruakura Cleaner No. 1, is as follows:—

	Per cent.
Sodium carbonate (anhydrous)	50
Sodium meta-silicate	25
Sodium hexametaphosphate	10
Sodium secondary alkyl sulphate (21 per cent. solution)	10
Alkyl polyether solution	5

Forming Tablets

Such a mixture may be formed into tablets by a very simple procedure. The first three components are thoroughly mixed, and with the mixer running, the mixed wetting agents are poured in slowly. A thick paste results which may be extruded and cut into pellets, each weighing 21 grammes, with a wire cutter. After being cured for an hour at room temperature the pellets may be packed. Curing is due to the carbonate taking up water from the wetting agent solution and so acting as a cement.

The best way of using the tablets on the farm is to drop one into each 3-gallon bucket and to allow hot water to run in. Slight crushing of the tablet followed by stirring with a piece of wood will ensure that a solution is formed rapidly. It has been noted that when the water temperature is low the tablets may not break up promptly. This tendency may be reduced by extruding the tablets with a hole in the centre, so increasing the surface area.

Results of Practical Tests

All tests were carried out under well-controlled conditions at three different dairies in which 10-12 cows per set of cups a milking were handled. The same type of inflation was used for all fat-uptake trials and a constant period of 4 weeks was used. Fat uptake was measured by putting 4 weighed inflations into 1 set of cups. After 4 weeks these inflations were removed, the surface contamination cleaned off, and absorbed water removed by drying them for at least 16 hours in a vacuum desiccator. The inflations were then weighed. The effect of cleaner solution on the rubber used was checked in all cases and found to be negligible.

Table 1 sets out the cleaning-water temperatures at the dairies involved and Table 2 the fat-uptake figures for typical experiments.

TABLE 1—CLEANING-WATER TEMPERATURES

Dairy	Temperature (degrees F.) Morning	Afternoon
A ..	212 (boiling)	175
B ..	145	105
C ..	180	140

TABLE 2—FAT-UPTAKE FIGURES FOR TYPICAL EXPERIMENTS

Dairy	Period of test weeks	Cleaner	Fat absorbed (av.) grammes
A ..	4	Caustic	0.36
A ..	4	Ruakura	0.51
B ..	4	Caustic	1.79
B ..	4	Ruakura	1.42
C ..	4	Ruakura	0.47

Both cleaners were used twice a day following a cold-water rinse, the caustic soda being used at 0.05 per cent. concentration as recommended by the Dairy Division, Department of Agriculture, the Ruakura cleaner at 0.15 per cent. The caustic soda solution was distinctly more alkaline than the detergent in the water available at the dairies.

Metal Cleaned More Effectively

In all cases the metal components of the machine were cleaned much more effectively by the detergent, and the tendency for milkstone and fat deposits to form was greatly reduced. The metalware cleaned with the detergent had a clean, shiny appearance. The effect on fat uptake by rubber can be seen from Tables 1 and 2. When the water is really hot, as at dairy A, both caustic and detergent are excellent with the caustic soda showing some superiority. However, when the water is not boiling the detergent is superior to caustic soda as shown in the figures for dairy B. At dairy B the temperature of the water was lower than is recommended when caustic soda is used. At dairy C, where the detergent only was used, a good result was obtained despite water temperatures well below boiling. It should be noted that at fat-absorption figures less than 2 grammes it is not possible with the type of rubber used to detect practically any change in dimensions due to fat absorption, and the life of the rubber is determined by cracking and other factors.

The detergent is as effective as caustic soda in preventing the uptake of fat by the rubberware and with the inflations in which the fat uptake was greatest there was no detrimental swelling of the inflations. Trials for longer than 4 weeks have so far given the same relative results, the life of the inflations being controlled by factors other than fat absorption.

Although the detergent is used at a concentration three times that of the caustic soda, its cost is not excessive, because the cost of the constituents is less than half that of caustic soda.

The results of these preliminary trials may be summarised thus:—

The Ruakura detergent is approximately as effective as caustic soda in preventing the absorption of fat by inflations.

When the water is not boiling it is probably superior to caustic soda in cleaning metal components, particularly separator discs and similar material.

Persons normally affected by caustic soda showed no reactions to the detergent at the concentration used for cleaning milking machines.

The tablets make it possible to prepare a solution accurately.

It has been shown by J. M. Kristensen ("The New Zealand Journal of Agriculture", October, 1950) that caustic is superior to washing soda, in checking fat absorption, so that the Ruakura detergent is probably superior to other alkalis unless these are used in much greater concentration than is usual.

Because of its mildness, the Ruakura mixture may be used as a general-purpose detergent which is effective in hard or acid water.

Further trials of the detergent mixture have been begun on a larger scale and will be continued over a season. These should enable its value for preventing fat absorption in inflations and milkstone deposits on metal surfaces to be determined accurately under field conditions. Regular bacteriological examinations are being made of milk samples from sheds in which the detergent mixture is being used. These should give an indication of its value in preventing bacteriological contamination from the milking machine.

Banding of Game Birds for Research Work

THE banding of wild ducks, an important aspect of research work conducted by the Department of Internal Affairs, was first undertaken in 1948 and 5000 grey and mallard ducks were banded in 1950, bringing the total of birds marked since the scheme began up to 7000. This year the Department plans to band the same number of ducks as last year. Trapping stations have been increased to five and it is hoped 1000 ducks will be banded at each. Traps were set up in January near Dunedin and Christchurch and in the Manawatu, the Waikato, and Dargaville districts.

Banding work has now been extended to cover upland game birds. This autumn Californian quail will be banded in the Rotorua, Nelson, Marlborough, southern lakes, and Otago districts and bands have also been supplied to acclimatisation societies for the marking of pheasants.

In previous years farmers and sportsmen have responded readily to the requests from the Department of Internal Affairs for the return of bands taken from birds shot in the open season, together with details of date and locality. Data returned have been collated and much valuable information essential to the understanding of game-bird problems has been obtained.

Movements of Ducks

Of ducks marked in the Manawatu, grey ducks have been found to move both north and south, but mallard have not moved further than 25 miles. Whereas mallard are restricted in their movements in the North Island they behave like grey ducks in the South Island. From Southland both species range into North Canterbury.

A duck being released from a trap after being banded by an officer of the Wildlife Service at a lake near Dunedin.

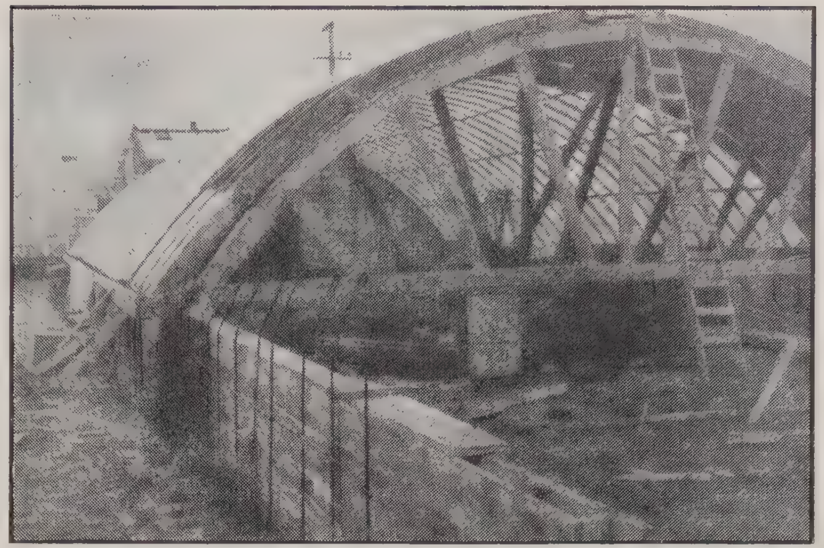
The longest flights recorded to date are those of grey ducks banded in the Waikato and recaptured at Te Kinga (Westland), Queenstown, and Winton (Southland).

Bands are marked "Return Wildlife Service, Government Buildings, Wellington." All bands received at the Wildlife Service are acknowledged promptly. Details of the date and place where the bird was ringed are supplied to the sender.

Quonset - type Glasshouse

By D. A. RICHARDSON,
Horticultural Inspector,
Department of Agriculture,
Invercargill.

TRENDS in glasshouse design have undergone many changes over the last few years, but from the Quonset or Nissen hut, used in the Second World War and familiar to many ex-servicemen who served overseas, has been adapted a design which well may revolutionise glasshouse construction. Such a glasshouse has been erected in Invercargill recently and has proved such a sound proposition that it was decided to build another and larger glasshouse 108ft. long with the same concrete moulds. A further extension of modern ideas is that the construction work is entirely in reinforced concrete.



The new 108ft.-long Quonset-type glasshouse under construction, with the smaller, completed glasshouse of similar design in the background.

THE idea for this type of glasshouse was developed by Mr. C. Diack, a commercial nurseryman of Invercargill, who after much thought and study of recent literature, both local and overseas, decided to erect the Quonset-type glasshouse, as he felt that at least it would be equal to the conventional type as regards cost in construction and would be more economical to run and maintain.

Details of the first building constructed are:—

Foundations: These are at a depth of 2ft. 6in. and extend 3ft. above the ground, being of a 4 to 1 concrete mixture. They are 10in. wide at the base and 8in. at the top, reinforced with ½in. round steel and side-wall buttresses 2ft. wide at the base and tapering to a point at the top of the foundation.

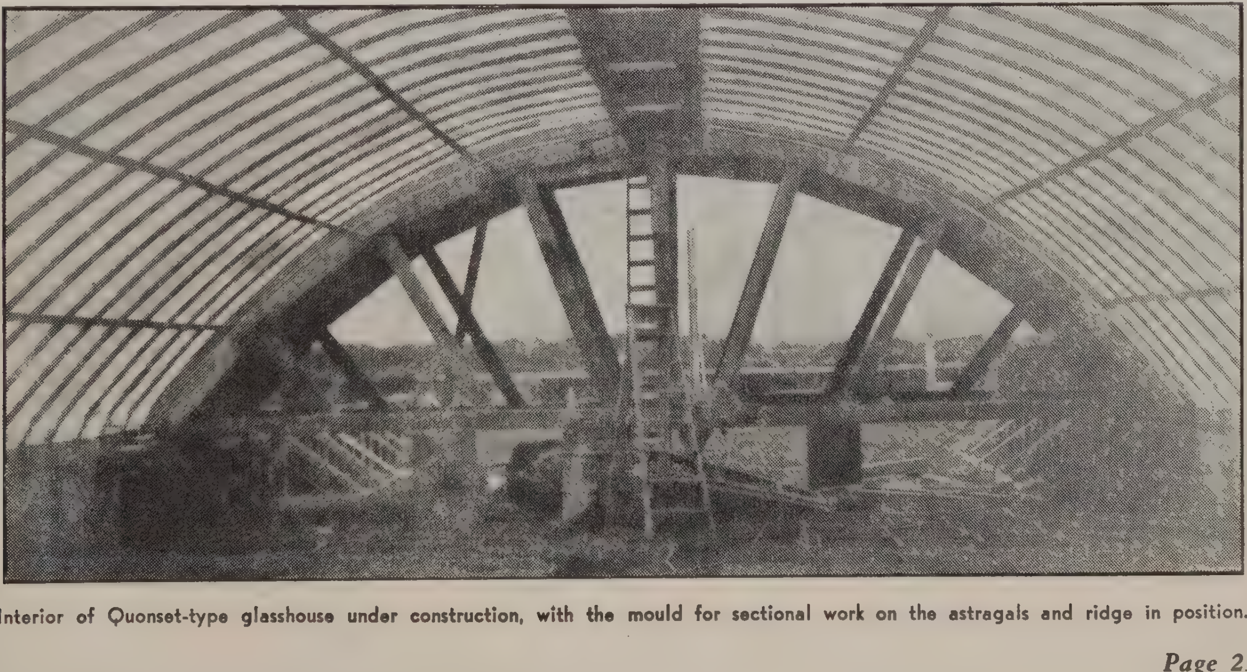
Guttering: The guttering is incorporated in the foundation tops and is 8in. wide with a 4in. concrete side and served by 6in. clay down pipes.

Astragals: These are 7in. at the base, tapering to 3in. at the apex. A rabbet 1in. deep x ⅜in. is left to carry the glass, which is 18in. wide x 12in. and 24oz. in weight, set in with putty, and covering 2160 sq. ft. Purlins or cross-members are also 7in. at the base and 3in. at the apex, spaced 4ft. apart.

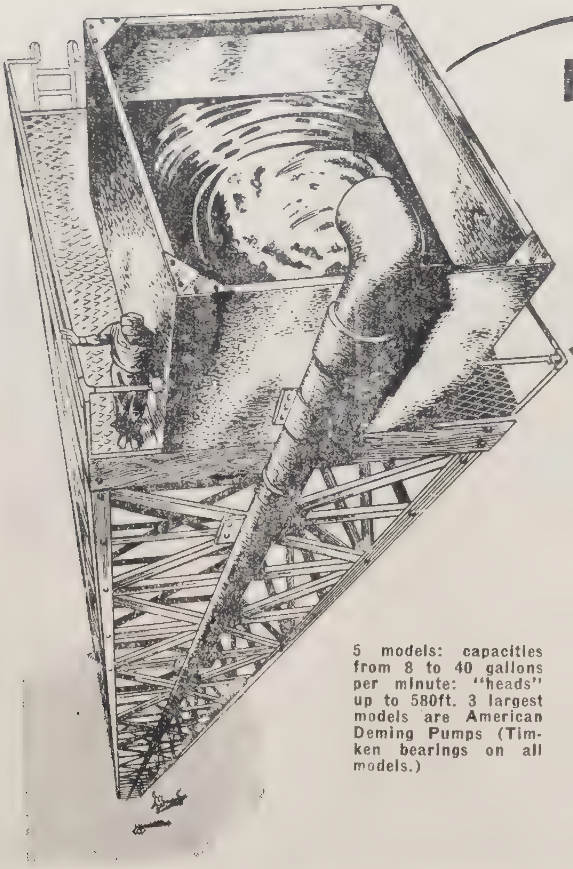
Ridge: This is 3ft. wide and 7in. deep. All concrete above the spouting level is of a 6 to 1 mixture.

Ventilators: There are 8 ventilators, each 14in. x 10in., of metal-covered wood, set in the ridge at equal distances apart. They are operated by a single control wire from the propagating room and may be adjusted as required.

Method of construction: The boxing for the foundations and side wall is put in, the moulds for the astragals



Interior of Quonset-type glasshouse under construction, with the mould for sectional work on the astragals and ridge in position.



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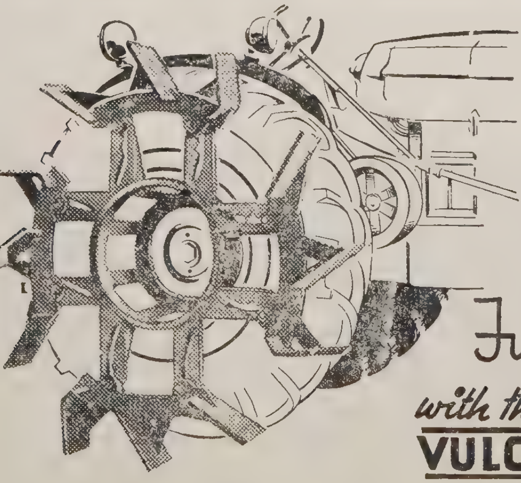
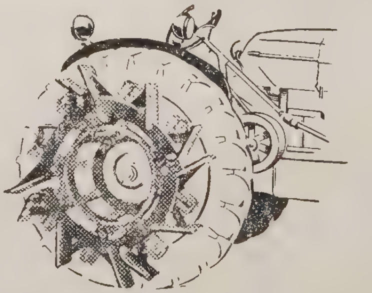


Gripper expanded ready for hard work.



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and ridge, etc., placed on top, and the concrete poured on. The foundation reinforcing is joined to the astragal reinforcing at 2ft. above the side wall. The mould, which is plainly seen in the illustration on this page, does 4 rows of glass and after the concrete has set it is moved on to the next set of rows.

Heating: Heating is provided by a hot-water boiler situated 8ft. below the level of the propagating room, which joins the Quonset-type glasshouse and a gable-type glasshouse of the same area. This boiler is fired with slack coal by an automatic stoker and the glasshouse is heated from two 4in. pipes by thermo-siphon circulation.

Propagating benches: There is a propagating bench along each side wall; the benches are also made of concrete, which is 2ft. 6in. wide and 3in. thick with a 3in. wall on the side. There is a plug in each table, thus providing bottom irrigation, which is preferable to overhead watering, of the seedling boxes. The heating pipes run along underneath the benches, thereby assisting germination and growth. (The benches also cause the hot air to be pushed out toward the centre of the glasshouse before rising.)

Capacity of House

The glasshouse has held 700 boxes of seedlings at one time, in addition to 550 tomato plants. The Quonset-type glasshouse was joined to the gable-type glasshouse, which was heated from the same unit, thus allowing a comparison to be made of the two types. It was found that the Quonset-type glasshouse reached the desired temperature 1 hour earlier than the other, with a corresponding saving in fuel; also a better price was obtained for the crop, which came to hand almost 3 weeks sooner.

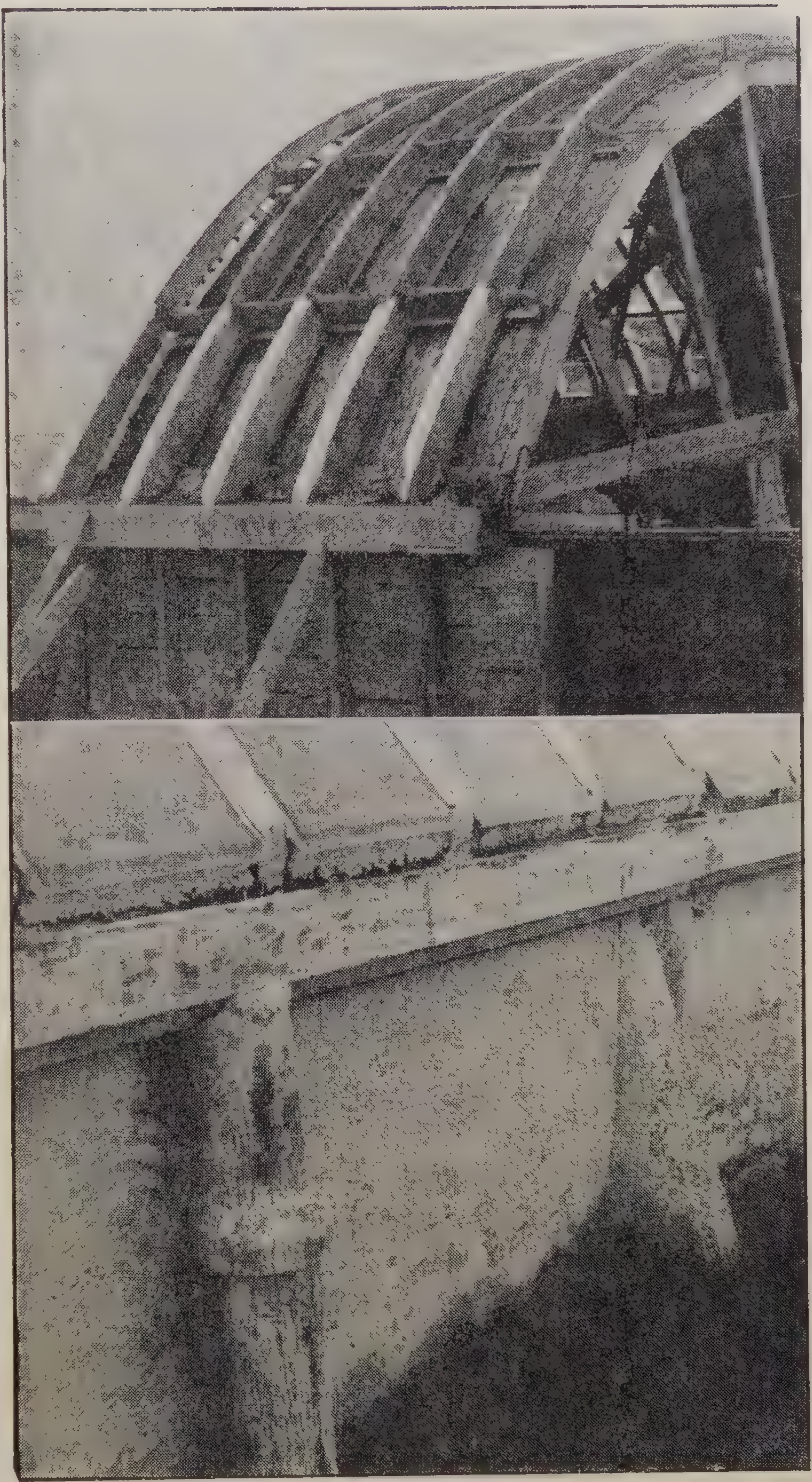
The measurements of the Quonset-type glasshouse are 54ft. x 30ft. x 11ft. 6in. high. In all 2160 sq. ft. of glass is used, which is 300 sq. ft. less than for a gable-type glasshouse covering the same area.

An 8ft.-wide sliding door at each end allows the entry of a mechanical cultivator or truck and, as there are no uprights or principals in the Quonset-type glasshouse, all the soil in it can be treated or removed and replaced with fresh soil.

The shape of the roof has been the means of giving the glasshouse protection against hail.

The maintenance costs are very low, as only the painting of the putty is required. This work is made much easier because there is ample strength in the concrete structure to permit the use of a heavy plank laid across the astragals for the workers to stand on.

The building appears at first sight to exclude a certain amount of sunlight, but after closer inspection and taking the actual results from all angles into consideration, it is now agreed that this oval-shaped glasshouse is probably the owner's answer to the short growing season common to Southland.

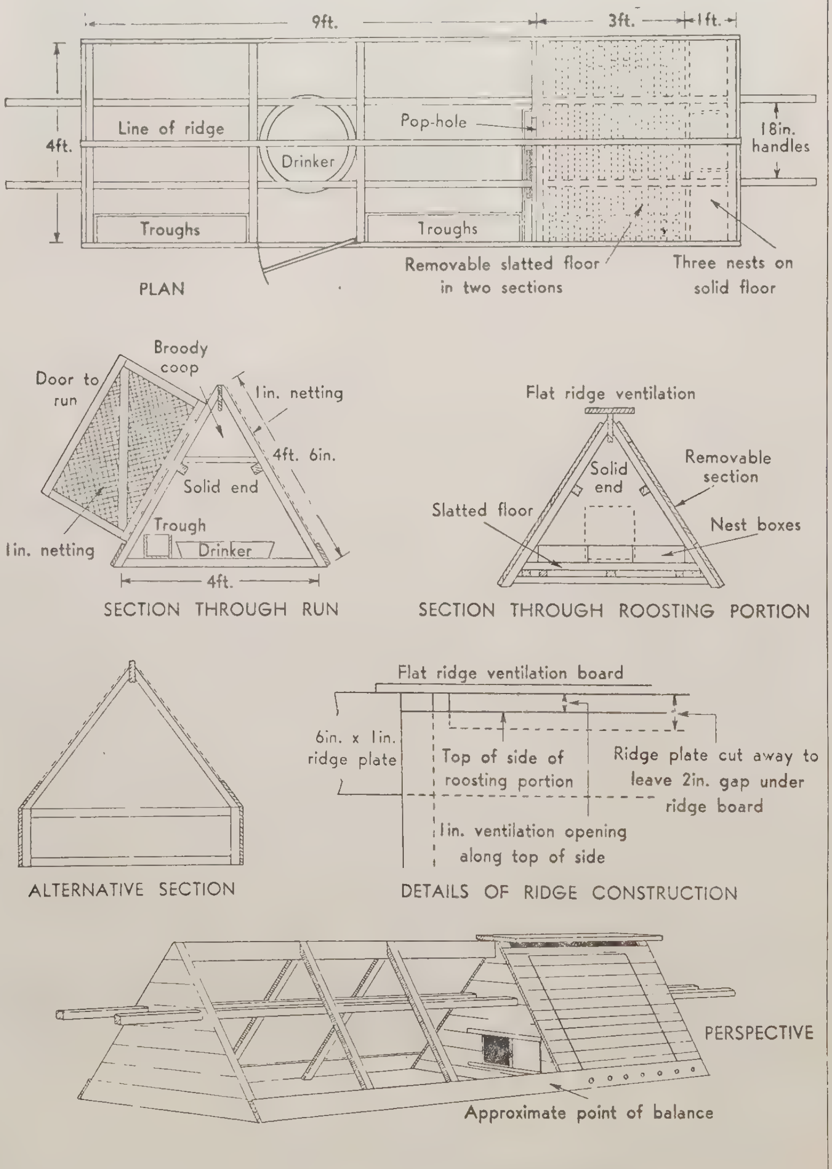


Upper—Exterior view of Quonset-type glasshouse, showing set of astragals almost completed. Lower—Section of the side wall, showing buttress, guttering, which is in the foundation tops, and down pipe.

Movable Poultry Housing

VERY little work has been done in New Zealand to date with movable houses, fold units, and slatted-floor houses for laying hens. Many points can be enumerated for and against this type of house, but some of its advantages are that it gives control of the birds in small lots, efficient use of restricted areas of ground, and beneficial effects on the sward. The three basic types of such units are described in this article by S. G. Haddon, Poultry Instructor, Department of Agriculture, Auckland.

Fig. 1—Fold Unit for 12 Birds


9ft.
3ft.
1ft.
4ft.
Line of ridge
Drinker
Pop-hole
18in. handles
Troughs
Troughs
Removable slatted floor in two sections
Three nests on solid floor
PLAN
Broody coop
Door to run
1in. netting
4ft. 6in.
Solid end
Trough
Drinker
1in. netting
4ft.
SECTION THROUGH RUN
Flat ridge ventilation
Solid end
Removable section
Slatted floor
Nest boxes
SECTION THROUGH ROOSTING PORTION
ALTERNATIVE SECTION
Flat ridge ventilation board
6in. x 1in. ridge plate
Top of side of roosting portion
Ridge plate cut away to leave 2in. gap under ridge board
1in. ventilation opening along top of side
DETAILS OF RIDGE CONSTRUCTION
PERSPECTIVE
Approximate point of balance

LAYING birds give higher production in small than in large units. Commercial flocks in pens of 50 birds give better results than the same birds in pens of 100 or 150. With movable housing the largest size of pen rarely contains as many as 50 birds, 12 to 25 being more usual.

Using fold units or movable houses for poultry in a paddock is equivalent to controlling grazing with electric fences or hurdles which allow stock access to a limited area of pasture for a definite time. Poultry in fold units are removed from one piece of ground before they have fouled it too heavily, and by the time that area is again used it has had ample opportunity to develop a fresh growth of grass.

Poultry droppings are probably the best all-round fertiliser obtainable. It has been estimated that in 1 year 100 birds will produce the equivalent of 4cwt. of sulphate of ammonia, 3cwt. of superphosphate, and ½cwt. of sulphate of potash.

Against these advantages must be set out some important considerations—the danger of overcrowding and the ease with which it can come about, the limitations of a suitable type of country, high labour costs, and the shortage of suitable timbers and materials.

Overcrowding may be caused in two ways—by keeping too many birds in a house, and by leaving a unit too long on one spot. Either or both will wreck the system whether fold units or movable range houses are used.

Steep, rough, or hilly country is not suited to this type of house because it increases the labour of the daily move and the difficulty of providing adequate drinking water. A spring or autumn flush of growth can also wreck the system if the units cannot be moved through the long grass and the birds cannot scratch down through the hard mat formed when folds ultimately are moved.

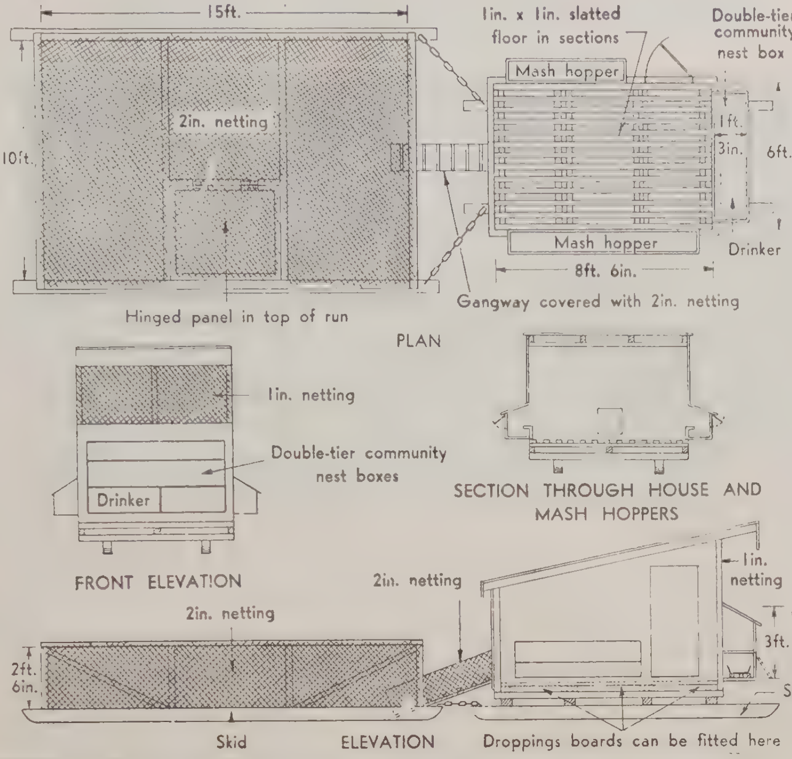
Unfortunately, high labour costs are inherent in any system which depends on frequent moving of folds or pens for its success. This system is used widely in England, where labour is cheaper than in New Zealand, and the poultry flock is then regarded as a rotational crop kept for the long-term benefit of the land rather than for the immediate return of eggs.

Materials and Dimensions

Until recently most New Zealand farm buildings embodied large quantities of heavy rimu and similar woods the weight of which precludes their use in movable structures. The use of seasoned pine has alleviated the problem of weight, but that of obtaining strength in the structure remains. Waterproof, bonded plywoods and sheet and corrugated aluminium are available; they are all light and strong, but expensive.

Poultry keepers who wish to give the system a trial should bear in mind the following basic requirements: A fold unit or slatted-floor house with run attached should allow a minimum of 4 sq. ft. per bird. The roosting portion of such a unit should allow a minimum of 1 sq. ft. of floor space per bird. If perches are used instead of a slatted floor, they must allow 8in. each for light-breed birds or 10in. each for heavy-breed birds.

Fig. 2—Slatted-floor House and Run for 50 Birds


15ft.
10ft.
2in. netting
Hinged panel in top of run
1in. x 1in. slatted floor in sections
Double-tier community nest box
Mash hopper
Mash hopper
1ft. 3in.
6ft.
Drinker
8ft. 6in.
Gangway covered with 2in. netting
PLAN
1in. netting
Double-tier community nest boxes
Drinker
FRONT ELEVATION
SECTION THROUGH HOUSE AND MASH HOPPERS
2in. netting
2in. netting
1in. netting
2ft. 6in.
6ft.
3ft.
Skid
Skid
ELEVATION
Droppings boards can be fitted here

In addition to the floor area specified, space must be found for nest boxes, food troughs and hoppers, and drinking vessels.

Following are descriptions of the three basic types of movable poultry houses.

Fold Unit for 12 Birds (Fig. 1)

The fold unit for 12 birds (Fig. 1) is rectangular in plan and triangular in section. The roosting portion (4ft. x 4ft.) allows 12 sq. ft. of slatted floor for the birds to roost on and 4 sq. ft. for nest boxes. Access is by a removable panel or door in the sloping side. The run portion is **4ft. by 9ft.**, making the unit 13ft. long over all. A wire-netting broody coop may be incorporated at one end of this run if desired. Food troughs are placed on the low walls of the run where some shelter is obtained, and the drinker may be suspended from the ridge or placed on the ground inside the run.

Provision for moving such a fold may be made in one of several ways. The simplest method is to use the handles shown in the diagram and move the unit sideways its own width each day. If a pipe axle carrying a pair of small, wide-rimmed wheels is passed through the unit from one side at the point of balance, it can be wheeled for short distances, two planks facilitating the work greatly.

Before the unit is moved the drinker should be taken out, and confining the birds to the roosting portion is better than risking breaking their legs.

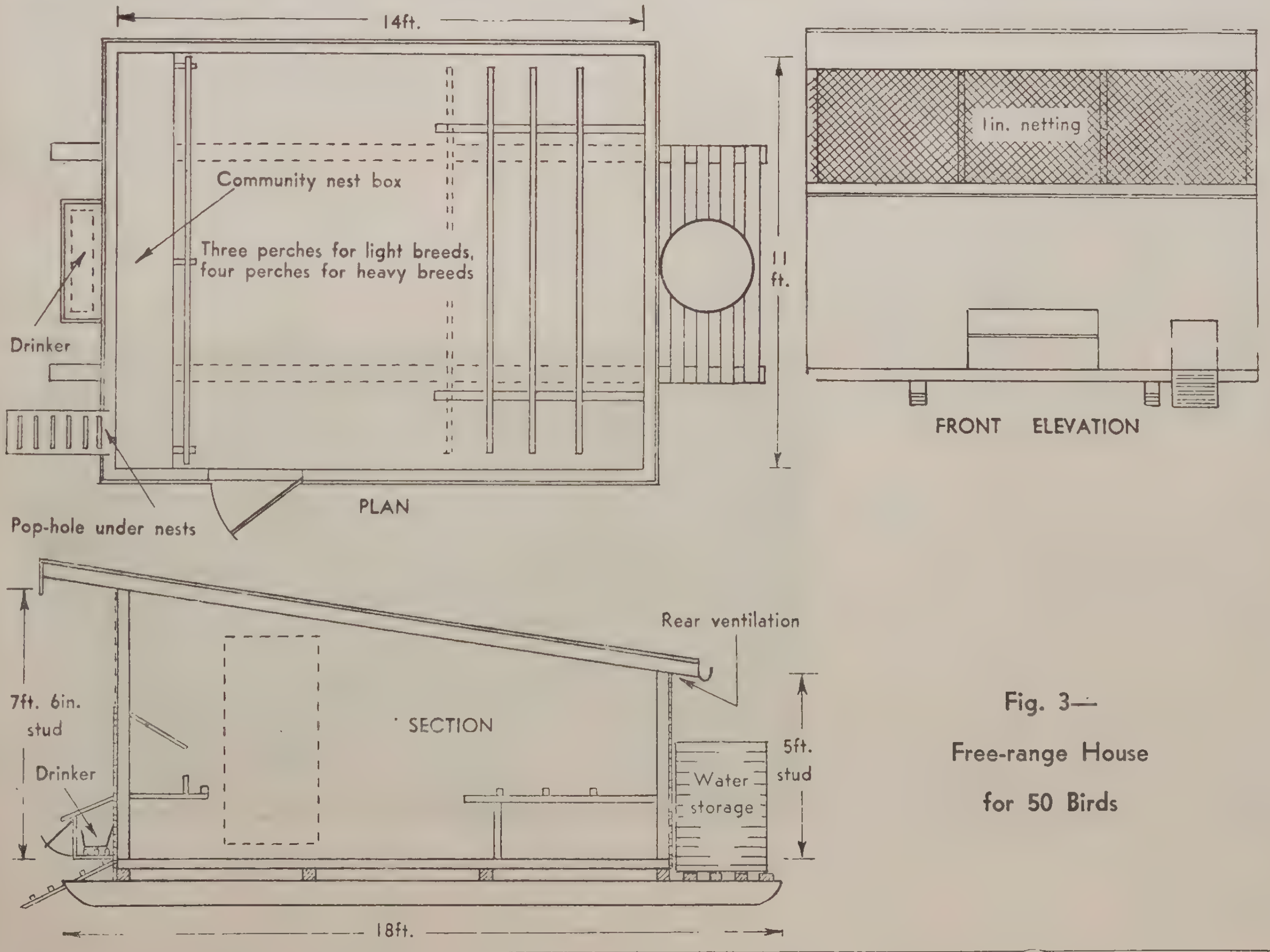

14ft.
Community nest box
Three perches for light breeds, four perches for heavy breeds
Drinker
Pop-hole under nests
PLAN
11 ft.
1in. netting
FRONT ELEVATION
Rear ventilation
7ft. 6in. stud
Drinker
SECTION
Water storage
5ft. stud
18ft.

Fig. 3—
Free-range House
for 50 Birds

Slatted-floor House and Run for 50 Birds (Fig. 2)

While providing accommodation for more than a dozen birds, the slatted-floor house and run for 50 birds (Fig. 2) enables close control over the use of pastures to be retained. It is in two parts, which may be moved separately or as one unit when hitched together with chains. It is much heavier than the 12-bird fold and a draught horse or tractor is needed to move it.

Using angle iron and enlarging the run somewhat from the dimensions shown (10ft. x 15ft.) enable house and run to be left in one position for about a week, but the use of all types of fold-unit housing depends on the weather, as prolonged wet weather may force the farmer to move the units more frequently than was expected. (During one wet spell the writer was faced with the labour of moving 21 units twice daily for nearly a week.)

As in the fold unit, the floor of the house is made of bevelled slats on which the birds roost at night. Removable droppings boards may be slid under these if desired, or the droppings may be allowed to fall through on to the grass below. The house is shown mounted on skids, but could equally well be on wheels. House and run are connected by a removable tunnel of wire netting with a solid base.

The birds cannot remain shut up in this house during inclement weather. It is solely a compact shelter for nest boxes, food troughs, and roosting quarters, and any attempt to use it as an intensive house will lead to trouble and dissatisfaction.

Free-range House for 50 Birds (Fig. 3)

For use where adult stock may be allowed free range, the free-range house for 50 birds (Fig. 3) is a heavier type than the structures described previously because it needs to be moved to fresh ground only once or at most twice a year. It is also larger, because on some days it may be necessary or advisable to leave the birds shut in. For this reason 3 sq. ft. of floor space per bird has been allowed, and that size permits the use of perches (with or without droppings boards below), a solid floor, and litter—it is, in fact, a small edition of the standard type of intensive laying house.

In many ways this house is better than the 50-bird house with run attached, because more or less permanent arrangements can be made for food and water storage, though bulk storage of food and water for movable houses presents a problem which can be solved only on the spot. Rain water from the roofs of the units can be used, but dry weather entails the use of some form of portable water tank.

Success with fold units for poultry depends on strict attention to routine moving and to feeding and watering and on limiting the number of birds to the capabilities of the unit. A farmer who regards them as a short cut to cheap egg production will be disappointed.

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VACUUM CLEANER FORGE

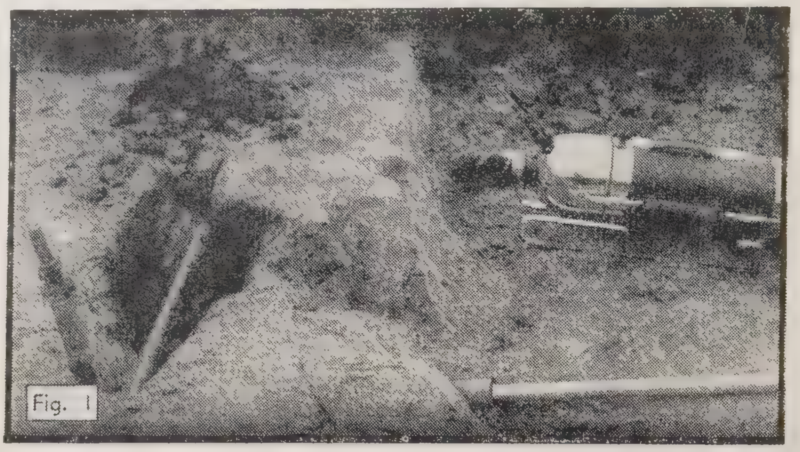


Fig. 1

FARMERS sometimes require work which involves the use of a forge and this often means a visit to a township at an inconvenient time. The forge described in this article, which operates on draught from a vacuum cleaner, can be set up quickly on the farm to deal with simple emergency jobs.

The forge is assembled in the following way: A T-shaped hole is cut in a clay bank, a piece of 2in. piping is laid along the stem of the T, and a wall of wet clay is raised over the pipe (Fig. 1). The material to be heated and bent—for example, a steel bar—is laid along the top of the T with the part to be bent exactly over the opening of the 2in. pipe. Kindling wood and paper are placed around the opening of the 2in. pipe and lit. As soon as the kindling is well alight coke is placed on top of the wood. The hose of the vacuum cleaner is inserted in the 2in. pipe from the **blower** end of the cleaner and the cleaner switch is turned on. The amount of draught depends on the distance the hose is pushed up the 2in. pipe (Fig. 2).

Care must be taken to see that the hose of the vacuum cleaner is attached to the blower end; if it is inadvertently attached to the suction end, as it is normally placed, embers will be drawn into the body of the cleaner and considerable damage will be done.

About 20 minutes after the draught has been applied a 1in. diameter steel rod will be white hot and bending can be carried out. It is advisable to inspect the metal as heating progresses, because the heat generated is sufficient to burn metal away.

Before making the type of forge described the farmer should make certain that the vacuum cleaner is effectively earthed.

—*G. S. BLACKETT.*

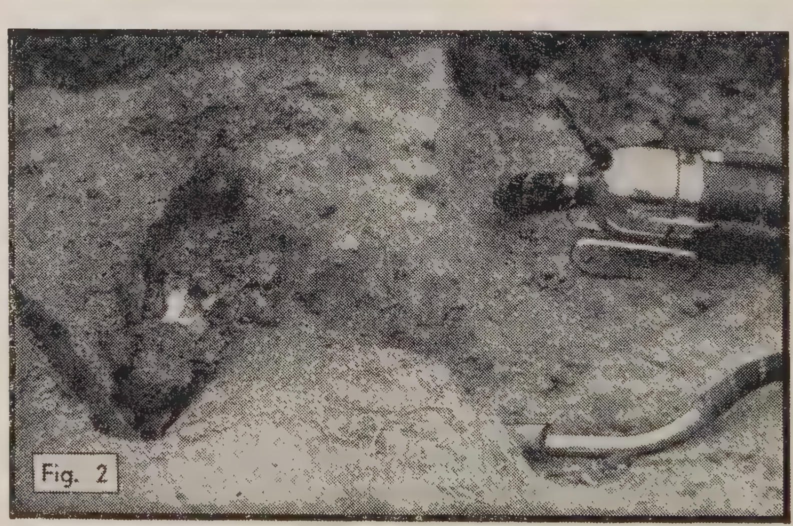


Fig. 2

Assessing the Value of Low-germinating Seed

MANY farmers believe that good seed must be capable of giving high germination when sown in the field. This view is not necessarily correct and this article by R. H. Schwass, Assistant Seed Research Officer, Seed-testing Station, Palmerston North, points out that in many cases it is more economic to purchase Certified seed of lower germination capacity. The article also explains a simple method for comparing the relative price asked for lines of seed having different germination capacity.

[*National Publicity Studios photo.*

Good pastures can be obtained from low-germinating seed if the sowing rate is increased.

HIGH-PRODUCING pastures and high-yielding crops should be the aim of every farmer. Good results depend upon several factors not the least of which is the quality of the seed used for the pasture or crop. Seed quality is a broad term combining assessments of such things as strain or type, purity, and germination; this article will be confined to some aspects of germination.

Relative Scarcity of High-germinating Lines

Each year the proportion of high-germinating seed coming on to the market varies, largely because of seasonal conditions affecting the degree of blind seed infection. As in most years there is not enough high-germinating seed to supply both the local demand and the export market, there is competition among farmers for high-germinating lines. This relative scarcity tends to cause high prices for them, and under these circumstances seed having a lower germinating capacity is more economic.

Officially drawn samples of all lines of Certified seed are tested at the Seed-testing Station in Palmerston North, and on completion of the tests for purity and germination a certificate of analysis is issued for every line. Purity and germination certificates are held by the merchants handling the seed and are available for inspection. Samples drawn by merchants from almost all lines of uncertified seed are also tested for purity and germination. Every farmer should see the relevant certificate before deciding on the purchase of any line of Certified seed.

Interim Germination Count

Lower-germinating perennial ryegrass seed is not necessarily poorer seed. In most cases it is only its lower germinating capacity which prevents it from being regarded as first-class seed. Details of germination tests given on the purity and germination certificate include a statement of interim germination count. The value of this figure lies in its being a measure of the vitality of the seed—seed with a high interim count is capable of germinating and establishing quickly. A line of seed with a final count of 80 per cent. and an interim count of 75 per cent. shows more vitality than another line also having a final germination of 80 per cent. but an interim count of only 40 per cent.

With all ryegrasses low germination is due largely to infection with the blind seed fungus, and perennial ryegrass provides an excellent example of seasonal variation in germination capacity. The fact that any line of perennial ryegrass has a relatively low germination does not mean that that germinating seed is also poor. Testing often shows that a line of perennial ryegrass infected with blind seed disease has a high interim count in relation to the final germination; that is, most of the live seed has germinated by the time the interim count is made. The seed which is capable of germinating has high vitality and is good seed.

It is sometimes claimed that low-germinating lines of seed give better results when sown in the field than they do under testing conditions, but this has not been proved. Indeed all available evidence indicates that laboratory germination figures are higher than field germination figures. That is to be expected, since results under controlled conditions record all seed which is capable of germinating, while many factors will operate in the field to prevent sprouting of some of the healthy seed or to damage some of the young seedlings.

Calculating Value of Seed

A simple method of determining whether lower-germinating seed is of good value for the price asked is to divide the price by the germination percentage. The result shows the price per unit of germination in that line. For example, in a line of 90 per cent. germination costing 30s. per bushel the price per unit germination is 4d.; in a line with a germinating capacity of 60 per cent. costing 22s. per bushel it is 4.4d. If the latter line costs 18s. a bushel, the unit price would be 3.6d. per unit of germination. At 18s. a bushel the second line, if it is of good type and satisfactory purity, is better value than the high-germinating line costing 30s. per bushel.

Calculation involving the price per pound or per bushel divided by the germination percentage can be used with all species of seed.

It is recommended that sowing rates for lines of seed having a lower germinating capacity should be increased so that about the same amount of viable seed is sown. If the normal practice is to sow 1 bushel of perennial ryegrass of 90 per cent. germination, then 1½ bushels of seed of 60 per cent. germination should be sown. Of course sowing rates for any seed will depend on normal practice for the district, soil and weather, cultivation, individual preferences, etc. Where adjustment in sowing rates has to be made there will be additional handling costs and other costs, because of the extra bulk of seed sown. This in turn means that the price asked must be slightly less than that based on a unit-value calculation to make the use of lower-germinating seed economic. A margin of about 2s. per bushel on lines of 50 to 60 per cent. germination should be adequate to cover extra costs.

Hard Seeds

Hard seeds occur in clovers and lucerne. Hard seeds are alive and potentially capable of germination, but because the seed-coat is impervious to water they will not germinate rapidly. There should be no hesitation in sowing clovers containing up to 10 per cent. of hard seed. A line of seed containing much greater amounts of hard seed should be viewed with caution and under some conditions it might be advisable to adjust the sowing rate. Some of the hard seed will germinate fairly quickly in the field and most of the remainder eventually.

Lower-germinating lines of seed frequently have certain advantages. Provided that the price asked for such lines makes them economic and that the germinating seed is of good vitality (that is, with a high interim count in relation to the final germination) they are well worth using. Certified seed of lower potential germinating capacity than is commonly regarded as desirable is still seed of good quality if its vitality is satisfactory.

Pasture Management and Crop Production

SEASONAL NOTES Contributed by the EXTENSION DIVISION

THE more important seasonal operations which require careful consideration are the grazing management of autumn-sown pastures, the sowing of autumn wheat, topdressing, and the place of nitrogenous and potassic fertilisers in the autumn topdressing programme. Potash responses are becoming much more widespread and careful attention should be given to the need for potash. In doubtful cases advice should be sought from the local Instructor in Agriculture.

* * *

GRAZING OF AUTUMN-SOWN PASTURES

White clover demands light, and controlled rotational grazing of young pastures encourages both clover and slower-establishing grass species. Autumn-sown pastures should not be allowed to become over-rank or be closed for lengthy periods in the late autumn and winter, if saved for spring feeding, unless they are of the temporary or short-rotation type. The grazing of young pastures on wet, heavy land often presents problems, as the land may be over-wet in the late autumn or early winter when the pasture is ready for its first grazing. On such land the aim should be to sow early in autumn after a summer fallow so that the first grazing may be secured before the land becomes too wet.

HAURAKI PLAINS EXPERIENCE

On Hauraki Plains land which is used for dairying and where the soil is often over-wet in the late autumn, the grazing of young pastures with cattle is normally impossible. Common practice has been to leave the autumn-sown pastures ungrazed over the winter, with the result that clover is suppressed and the young pastures are invaded by buttercup and pennyroyal. However, if the pastures are grazed with sheep (preferably wethers) for the first 6 months, excellent results are obtained. Clover establishment is satisfactory, buttercup and pennyroyal are controlled, and the surface soil is kept in an unbroken condition.

* * *

WHEAT

WHEAT growing in New Zealand is still not sufficient to obviate imports of grain from Australia. Farmers proposing to sow an area of this staple crop should have the seed-bed preparation well in hand. The ideal is to have a fine seed-bed below, but a rubbly surface which will not "run together" and cake so easily with autumn and winter rains. Frequent but judicious use of the grubber and harrows will achieve this aim more satisfactorily than other cultivation.

SEED WHEAT

In order that there will be be no delay when sowing time arrives, seed wheat should be ordered early. Certified seed of all the usually grown varieties is available from merchants in the wheat-growing districts. The use of certified seed is to be preferred because of its purity of variety and freedom from loose-smut disease. Certified Standard seed should be sown by farmers growing for a grain crop, but where it is proposed to retain the produce for seed purposes Certified Mother seed should be sown, and the area entered for certification. It is now the usual practice for seed wheat to be dusted with an organic mercurial dust before it leaves the merchant's store, and farmers are well advised to have their seed so treated, as it is the simplest and most efficient way of carrying out the operation.

WHEAT VARIETIES

Locality preferences for the different varieties were referred to on page 271 of the "Journal of Agriculture" for March, 1950. A new variety of which seed is now available in limited quantity is W.R.I. Yielder. In trials conducted by the Department the chief virtue of this wheat over Cross 7 appears to be its higher-yielding ability. Its real place in farming practice can be measured only after repeated trials by individual farmers, however.

FERTILISER FOR WHEAT

The Extension Division has carried out 183 fertiliser trials with wheat between 1928 and 1950. During the period 1928 to 1933 responses to 1cwt. of superphosphate per acre averaged each season between 3 and 6½ bushels per acre, but over the following years the effect of superphosphate steadily declined and for the last 10 years it has given an average increase in wheat yields of between 1 and 1½ bushels per acre each season in most years. This decline in the response of wheat to superphosphate has followed a steady improvement of pastures in the wheat-growing areas coupled with an increasing use of phosphatic fertilisers. Consequently the general fertility of the land has increased and the effect of superphosphate on wheat has become less marked.

RESPONSES ON PHOSPHATE-DEFICIENT SOILS

Nevertheless responses to 1cwt. per acre of superphosphate of up to 13 bushels of wheat per acre have been secured in recent years and several trials have shown responses of more than 4 bushels per acre. It is evident that highly payable responses to superphosphate may be obtained in cases where the soil type is highly phosphate deficient, or the wheat is grown after a succession of fertility-depleting crops or on land which has not had reasonable applications of phosphatic fertilisers in the past. Further, it is still a reasonable "insurance" to apply 1cwt. per acre of superphosphate with practically all wheat sown when 1 bushel per acre increase will practically meet the cost of the fertiliser. Exceptions to this practice might apply on land naturally of high fertility and which has had a history of adequate phosphatic manuring in the past and where the wheat does not follow a succession of fertility-depleting crops.

* * *

NITROGEN AND "OUT-OF-SEASON" GROWTH

PRODUCTION from many pastures in New Zealand is limited during winter and early spring not only by low temperatures but also by nitrogen starvation. Nitrogenous fertilisers applied to pastures of high annual production during this period will usually stimulate growth to a marked degree, provided climatic conditions are not too severe. In most of the humid regions of the North Island, for example, an application of 1cwt. per acre of sulphate of ammonia to a late-closed pasture for early-spring feed will give a greatly increased bulk of feed. If growth conditions are reasonable, stimulation occurs almost immediately. For example, in a recent experiment at the Marton Experimental Area, increases in pasture production of up to 44 per cent. occurred in the first fortnight's growth following an early-spring application of 1cwt. per acre of sulphate of ammonia.

NITROGEN AND SHORT-ROTATION RYEGRASS

Nitrogenous fertilisers applied for "out-of-season" growth to pastures containing appreciable amounts of short-rotation ryegrass may be expected to give marked responses, and experiments are being planned to obtain data on this point. Short-rotation ryegrass is naturally an excellent winter and early-spring producer, but its full potentialities in this respect are often not realised because of a lack of available nitrogen during this period. Nitrogenous fertilisers, and particularly sulphate of ammonia, must not be used in excessive quantities for pasture-growth stimulation because of the danger of suppressing the clovers in the sward.

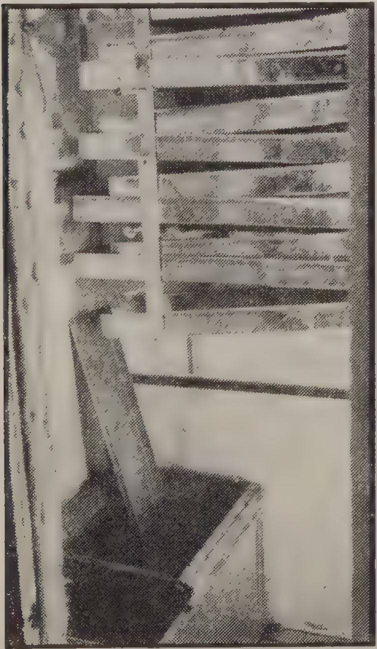
Independent Unit for Warming, Straining, and Drying Honey

By R. S. WALSH and D. ROBERTS, Apiary Instructors,
Department of Agriculture, Auckland.

OF all the appliances used in the treatment of honey those dealing with heating and straining have perhaps occasioned more thought and expenditure than any other single item of honey-house equipment. In nearly all systems of heating and straining the principle of direct heating has been applied; consequently it has not been possible to eliminate the danger of impairing the flavour and colour of the honey by over-heating it. This article describes a combined warming, straining, and drying unit in which the heating is indirect, designed by W. J. Fix, formerly Honey Grader and Apiary Instructor, Department of Agriculture.

THE cabinet should be insulated and conveniently situated within the honey-house where its outer walls will not be subjected to outside temperatures. In addition to insulating the walls, it is necessary to insulate the door, which must be well made and close fitting to prevent any loss of heat.

The extracted honey is pumped into the heating cabinet through an aperture near the roof so that it falls into the topmost tray. The position of the outlet by which the honey leaves the cabinet after being warmed on the trays and passed through the strainer will be governed by the position of the storage tanks. If the honey-house is built on the gravity principle, the honey will run from the strainer tank to the storage tanks directly below. On the other hand, if the storage tanks are on the same floor level as the warming cabinet, a second pump will be necessary, and provision must be made for a pipe leading from the strainer tank to this pump, which should be conveniently situated outside the cabinet.



[*Art Studios photo.*
The left side of the cabinet, showing strainer, reservoir, baffle plate, and arrangement of trays. The fan is in the top left corner.

A fan is necessary to maintain air circulation within the cabinet, and it must be in a position to create an upward flow of warm air through the trays for heating and drying the honey. The fan motor rests on a stand outside the cabinet, as the temperature within the cabinet would overheat the motor and cause it to burn out. To guard against over-heating through the fan breaking down and to stabilise the temperature in the cabinet a thermostat set at 135 to 140 degrees F. is wired into the electric circuit so that both fan and heater element cut off simultaneously.

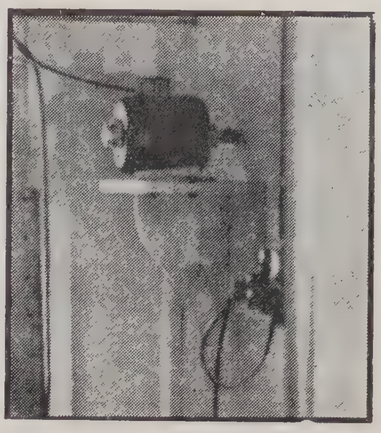
Advantages of Indirect Heat

Originally, the combined warming and straining unit was envisaged as a means of handling the delicately flavoured, heavy-bodied honey produced in parts of the South Island, but the unit was first used in the southern part of the Auckland district, where it proved eminently suitable for dealing with manuka and other honeys that are troublesome to strain. The plant described was built by Messrs. H. R. Holdaway and Sons, of Whangarei, who operate it with marked success.

The amount of heat required to ensure satisfactory straining depends upon the type and body of the honey passing through the extractor. Light-bodied honey may require a temperature no greater than 70 degrees F. for efficient straining, but a temperature about 10 degrees higher than that of the honey-house will assist materially in driving off the excess water in honey of this class.

For average honeys produced in North Auckland best results are obtained with temperatures around 130 degrees F.

During a day's work with a unit capable of putting through 1¼ tons of honey in 8 hours it has been found that it is not necessary to clean the strainer more than twice.



[*Art Studios photo.*
The fan motor in position outside the warming cabinet.

The correct application of heat to honey will accelerate straining and eliminate much of the clogging associated with strainers. It will help to drive off excess moisture in lighter-bodied honeys and reduce the risk of the honey absorbing atmospheric moisture in districts where humidity is high.

Heating System and Control

A single 2000-watt electric element attached to a movable stand is used for heating. It can be moved freely about the cabinet and placed in the most suitable position for warming newly extracted honey, and it has the added advantage of being adaptable when the cabinet is used for other purposes such as melting up tinned bulk honey. Provision is made for adequate air circulation by fitting a 15in. fan high up on one of the walls. Heated air from the radiator rises through the trays, and to ascertain the direction in which it is moving the fan is started and a few whiffs of smoke from a bee smoker puffed across the radiator, which is moved about until the correct position for the element is established.

As only heated air is used, there is no risk of discoloration of the honey or loss of flavour. In addition, the water content of the honey is lowered and the risk of fermentation greatly reduced. Honey flows over the trays at 2ft. per minute; it takes approximately 20 minutes to pass 1 cwt. of honey through the cabinet into the settling tanks. With warm honey air bubbles and wax particles rise freely to the surface, and if the tanks are carefully skimmed, the quality and condition of the product will be much better than that of unheated honey or of honey heated by methods in which direct heat is used.

The unit is easily cleaned, as the trays are not fixtures, but rest in one another, and may be lifted out for washing and cleaning.

Construction of Trays and Cabinet

Any beekeeper with an elementary knowledge of carpentry should have

WARMING, STRAINING, AND DRYING HONEY

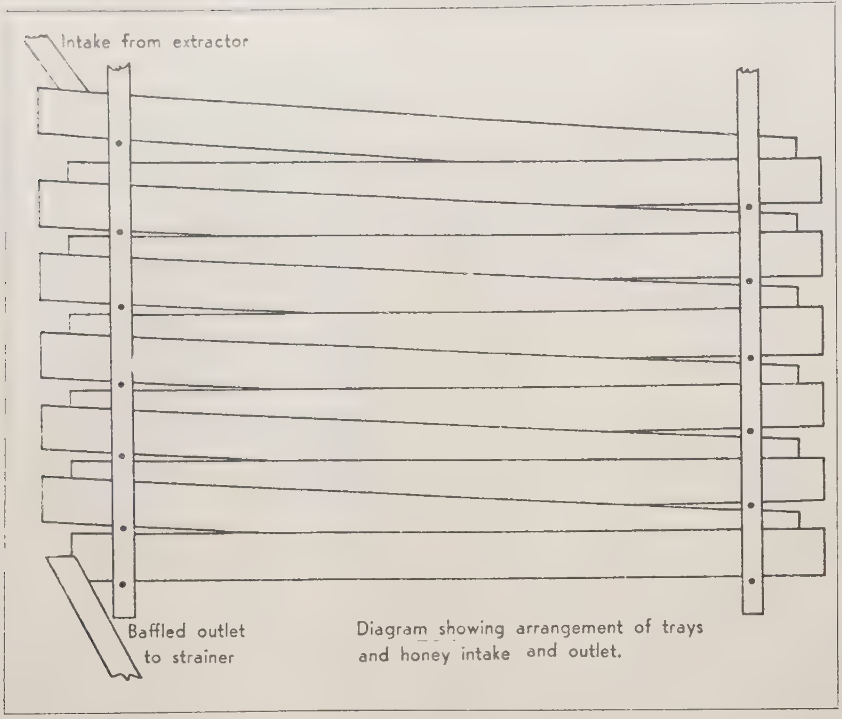


Diagram showing arrangement of trays and honey intake and outlet.

little difficulty in building the cabinet which houses the warming trays and strainer. However, the average beekeeper will prefer to have the trays made up by a plumber or tinsmith.

The materials required are:—

12 tinned steel trays.

1 tinned steel strainer reservoir.

1 V-shaped strainer.

Sufficient 3in. x 2in. timber to construct the framework for a cabinet 5ft. wide x 7ft. high x 3ft. 6in. deep (outside measurements).

Absorbent wallboard to cover the inside and outside walls, ceiling, door, and roof.

Insulating material (wood shavings or sawdust) for packing the wads.

Hinges and fastener for the door.

Nails, screws, etc.

Sufficient ½in. water pipe or other suitable material to make brackets to support the trays.

The 12 trays are made of tinned steel and are 3ft. 6in. long, not less than 9in. wide, and 2½in. deep. One end of the tray is closed and the sides at the opposite end are tapered sufficiently to allow part of the tray to sink not more than 1½in. into the next tray below, thus assuring a clearance of 1in. between the lip of the upper tray and the floor of the one beneath. Such clearance is essential if a free flow of honey is to be maintained. The trays are attached to the wall of the cabinet opposite the door, where they rest on a rack made of ½in. galvanised water pipe or other suitable material. It is necessary to arrange the rack so that each tray has a fall of 2in. in its length, which is achieved by staggering the supports.

Unless supers of honey are stored in a hot room before extraction, it would be an advantage to increase the fall of the two upper trays by another 2in., as cold honey will be slow to move when it first enters the cabinet and may bank up and block the trays.

The strainer, which is installed at the foot of the series of trays and stands in a small tank or reservoir 2ft. 6in. long, 1ft. 3in. wide, and 1ft. 3in. deep, is V-shaped and made of 50-to-the-inch mesh brass gauze. The honey does not fall directly into the strainer, but is baffled into it from the trays, as illustrated. After the honey has passed through the strainer into the reservoir it is piped off into the storage tanks.

So compact is the cabinet that little time is required to raise the temperature to the maximum for efficient working. Running costs are kept to a minimum, and there is no loss of heat, because the cabinet door does not have to be opened frequently as the strainer rarely clogs.

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DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during January and for the 6 months ended January 31, 1951, with comparative figures for the same month and 6-monthly period of last year, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

Period	Creamery	Tons Whey	Total	Percentage inc. or dec.	Tons Total in store at end of mth.
January, 1951	23,952	465	24,417	—	47,766
January, 1950	18,696	378	19,074	—	45,214
Increase or decrease	+5,256	+87	+5,343	+28.011	+2,552
For 6 months ended 31/1/51	107,941	2,001	109,942	—	—
For 6 months ended 31/1/50	109,578	1,931	111,509	—	
Increase or decrease	—1,637	+70	—1,567	—1.405	—

CHEESE—

Period	White	Tons Coloured	Total	Percentage inc. or dec.	Tons Total in store at end of mth.
January, 1951	15,545	184	15,729	—	24,596
January, 1950	10,748	2.899	13,647	—	26,877
Increase or decrease	+4,797	—2,715	+2,082	+15,256	—2,281
For 6 months ended 31/1/51	65,051	1,513	66,564	—	—
For 6 months ended 31/1/50	50,554	14,205	64,759	—	—
Increase or decrease	+14,497	—12,692	+1,805	+2.787	—

If these figures are converted into butterfat equivalent, there is a decrease of 0.562 per cent. in butterfat graded for the 6 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Waikato Farm Schools Association

THE Waikato Farm Schools Association conducts an annual course of instruction in farming subjects suitable for both sheep and dairy farmers. Features of the programme for 1951 are field days at the Department of Agriculture's Animal Research Station, Ruakura, Galloway Laboratory, and Rukuhia Soil Research Station, an open forum evening, a practical demonstration of electric break fencing methods, and, as well, there are 15 addresses on general farming topics.

The course, which will last from Monday, June 11, to Friday, June 15, will be held on the Claudelands Showgrounds, Hamilton. The fees for this year are £4 for the full course. Further information is obtainable from the secretary, W. G. Ranstead, Matangi, Hamilton.

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CHANGES IN POULTRY INSTRUCTORS' DISTRICTS

Until recently Timaru and Waimate were in the area served by the Department of Agriculture's Poultry Instructor stationed in Christchurch. These two centres have now been included in the area served by the Poultry Instructor at Oamaru, and in future correspondence from poultry producers in those districts should be addressed to the Poultry Instructor Department of Agriculture, Box 96, Oamaru.

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Use of Teat Salves in Machine and Hand Milking

QUANTITIES of milk and cream become inferior for manufacturing purposes by absorbing the smell of anything foreign with which they come in contact, or which is in the vicinity during their production. Unsuitable teat salves are a common cause of quality faults and this article by S. W. Low, Farm Dairy Instructor, Department of Agriculture, Motueka, draws attention to the need for care in the use of teat salves generally.

REGULATION 10 of the Dairy Produce Regulations 1938 prohibits the use of any poisonous or markedly odorous disinfectants on the teats of cows in milk and forbids the use in a supplying dairy of any other substances likely to taint milk or cream.

This Regulation has been necessary to protect the quality of dairy produce, but, apart from this prohibition, the utmost care is necessary in the use of any salve or disinfectant which may be used in the milking of cows or in the production of milk and cream.

Teat Salves or Unguents

Teat salves or unguents are manufactured by proprietary firms and are offered for sale to dairy farmers to assist the healing of cuts, abrasions, and various types of disease confined to the dairy herd, and also to soften the teats and assist to make milking easy.

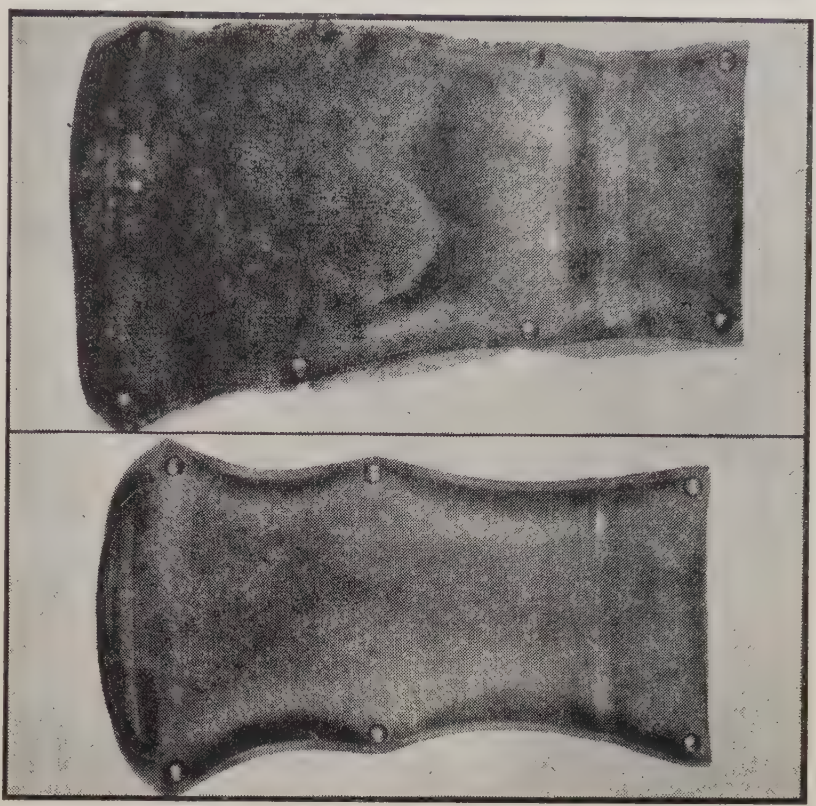
The base of these salves is usually a greasy or fatty compound with some form of healing balm, and fortified with disinfectant to destroy bacteria or germ life. Many salves also have a strong odour which will be absorbed by dairy produce, and the use of such should be avoided.

Disinfectants

Disinfectants usually obtained in liquid form are invariably of a markedly odorous nature and should be used for cleaning wounds only, and never during the process of milking or while cream is stored on the dairy premises. The most odorous of these contain carbolic or tar extract. Chlorine preparations (chloride of lime), also commonly used in the dairy industry, are of a particularly corrosive nature when brought in contact with dairy equipment. A special locker should be kept for the safe storage of all disinfectants. Milk or cream contaminated with disinfectant is not fit for use, and the majority of it is rejected by dairy factories as unfit for manufacturing purposes.

Effects of Salves on Rubberware

Fat and grease are the greatest enemies of rubber, as they cause its rapid destruction. It is a common practice to apply or smear a salve on the teats and attach the teat cups, with the result that because of the body heat of the cow and the squeezing action of the pulsator the fat or grease is forced into the rubber inflations.



Upper—The rapid destruction of an inflation by the penetration of fat from teat salves applied before milking is shown. In this condition an inflation is a serious contaminator of milk and is unfit for its purpose. It is in an extremely perished condition after 8 weeks' use. The surface has been destroyed by the penetration of fat from teat salves injudiciously applied, and the portion which comes in contact with the cow's teats is ruined. Lower—This inflation is in good condition after 16 weeks' use. The milking machine from which the exhibit was taken was cleaned by the boiling water-caustic soda method twice daily and teat salves were not used on cows' teats before the cups were applied.

The fine texture of the rubber is quickly destroyed, becoming soft and spongy and leaving cracks to absorb grease and fat deposits, which soon putrefy and become laden with bacteria, causing the lowering of the quality of milk and cream.

The elasticity of the rubber inflations so essential for quick and complete milking is exhausted, necessitating more frequent changing of the inflations and thereby increasing the work of maintenance.

Too often these salves are used indiscriminately, large amounts being placed on portions of the woodwork in the shed for convenience. The salve is then transmitted by the milker's hands to the rubber tubing, door handles, stools, and other dairy equipment, creating another source of contamination and involving additional cleaning.

If it is considered essential to use some form of healing salve, it is recommended that it be applied after the milking is completed, not before. Refined white petroleum jelly and boracic powder make an excellent healing balm.

A suitable disinfecting wash for cows' teats and udders before milking is a solution of condy's crystals, with sufficient added to cold water to produce a pink colour. The solution must be changed as soon as the colour disappears. Weak solutions of chlorine are also very helpful.

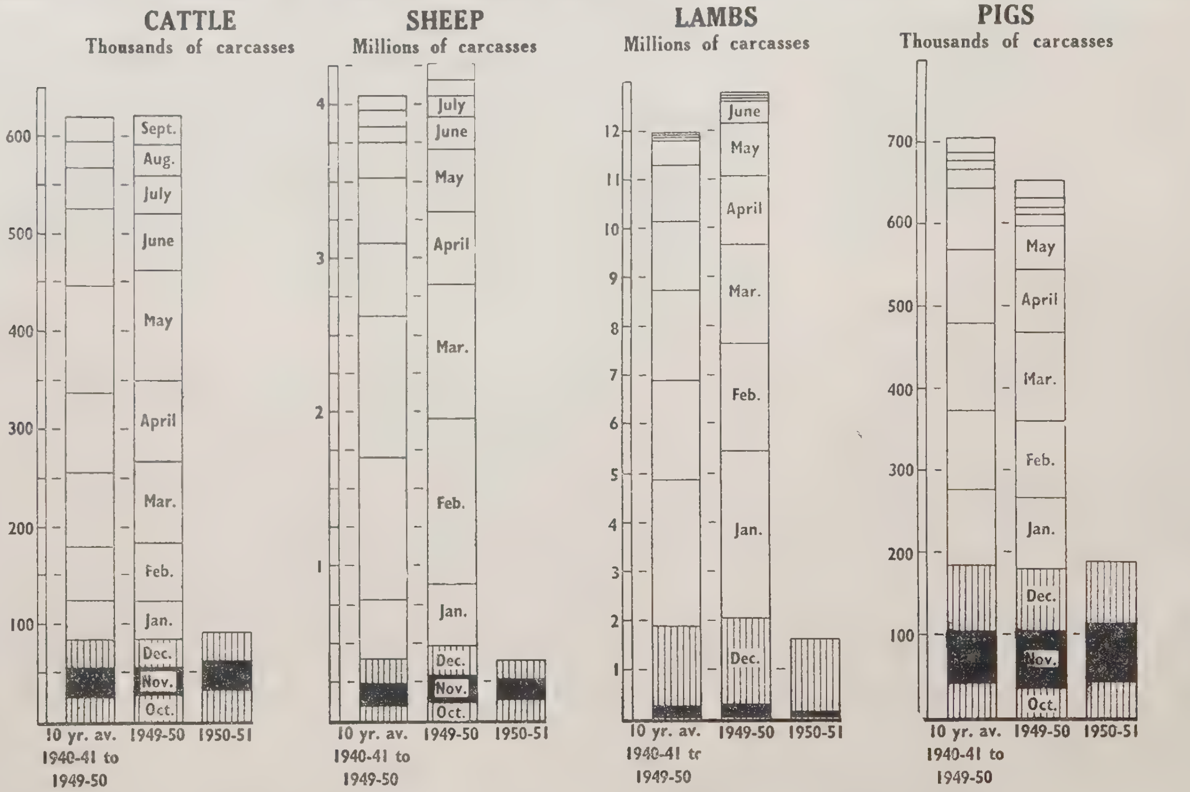
It is a common practice for hand milkers to use a small amount of salve to soften the teats and assist the milking action, and it is during this period that the milk absorbs any strong odour of the salve, and particles often drop into the bucket and become mixed with the milk. Extreme care must, therefore, be exercised when using salves during hand milking and stripping. In milking, the hands must be washed frequently and milk should not be used in conjunction with salves to lubricate teats during the milking process. A small application of an odourless salve is all that is required.

PRIMARY PRODUCTION MONTHLY REVIEW

From data supplied by the Statistical Section, Extension Division, Department of Agriculture, Wellington.

Livestock Slaughtered at Meat Export Works and Abattoirs

Season Oct. 1 to Sept. 30: Order of months October to September reading upward in each column

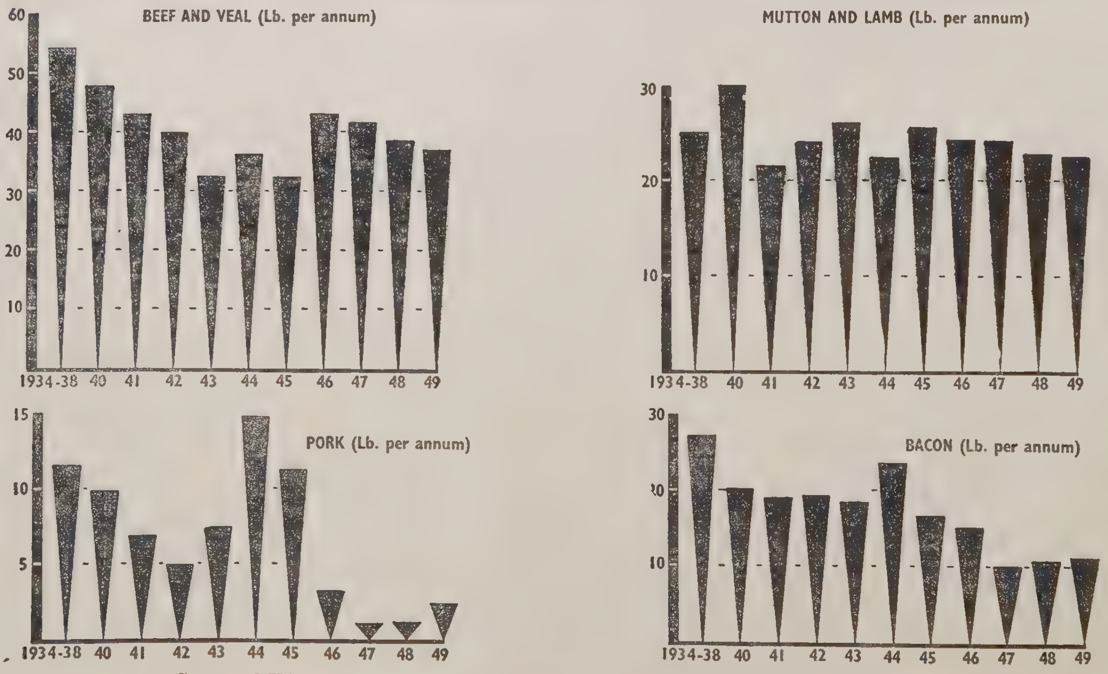

CATTLE Thousands of carcasses

SHEEP Millions of carcasses

LAMBS Millions of carcasses

PIGS Thousands of carcasses

Main Items of Meat Consumption per Head in United Kingdom



Source of U.K. data: Commonwealth Economic Committee (1949 figures estimated).

Fruit Tree Crop Failures

THERE are probably few growers of fruit, either on a commercial or a domestic scale, who have not been disappointed at consistently poor crops from some of their trees. This article by A. T. J. Watts, Stone Fruit Specialist, Horticulture Division, Department of Agriculture, Dunedin, explains some of the causes of such failures and suggests ways of overcoming them.

[*Green and Hahn Photography Ltd. photo.*

TO know why certain trees do not crop it is necessary to understand the sequence of events in the production of fruit. The details vary in different kinds of trees, but a brief general outline, applicable to most, can be given.

During spring and summer a tree makes young wood growth, at intervals along which leaves are produced and in the axils of the leaves buds are formed. These may be either of two kinds, leaf or wood buds and flower buds. The number and proportion of each type depend to a great extent on the vigour, age, and variety of a tree and also on the amount of plant food and the proportions of carbohydrate and nitrogen available in spring and summer. Apple and pear trees rarely form fruit buds on young growth, but only on wood at least 2 years old, while peaches and nectarines produce fruit buds only on growth of the current season and never on old wood.

In autumn the buds enter a resting stage and there is little change in their outward appearance until the following spring. The low temperatures of winter, however, have important internal effects on the buds in breaking the dormancy, thus allowing them to develop when conditions become more favourable. For each kind of fruit, and indeed each variety, there is a certain chilling requirement and if the temperature does not fall low enough or remain below the critical point long enough, buds will open late in spring, or they may not open at all.

Different kinds of fruit and different varieties of the same kind flower in a more or less constant sequence each season; apple and pear trees, for example, blossom much later than apricot and peach trees. There are also variations in the number of flowers produced from each bud; peach and plum trees develop only one flower from a bud, whereas buds on apple and pear trees produce clusters of flowers.

Most of the common fruit trees bear perfect flowers, that is, flowers with both male or pollen-bearing parts (anthers) and female parts (stigma and ovary). In a few kinds there are two different types of flower, male and female; these may occur on separate plants, as in the Chinese gooseberry, or on the same plant, as in the hazelnut, some varieties of persimmon, and some paw paws.

Flowers of most fruit trees secrete a sweet fluid (nectar) which attracts bees. In collecting nectar the bees brush against parts of the flower and so transfer pollen shed by the anthers of one flower to the stigma of another flower. Here, if conditions are favourable, the pollen grains germinate, sending tubes down the style to the ovule. Down this tube moves the hereditary material from the male, or pollen parent contained in a nucleus, which passes into the ovule, the nucleus of which contains the hereditary material of the seed, or female parent. The fusion of the two sets of parental material in the nuclei, to form the seed, is known as fertilisation, as distinct from pollination, which is merely the transfer of pollen to the stigma, a process not necessarily followed by fertilisation.

Fertilisation, by the formation or release of hormones, stimulates the tissue surrounding the ovule into comparatively rapid growth which results in the formation of a fleshy covering, the "fruit". In nature the seed is the important part, ensuring the perpetuation of the species, the outer covering serving merely as a protection or as an aid to distribution. To man the flesh surrounding the seed is the significant part, except, of course, in cases such as nuts or grains, where the food reserves stored in and around the embryo form the edible portion. In some fruits, for example, oranges and grapefruit, seeds are a definite disadvantage, and where species can be propagated vegetatively (by cuttings, budding, etc.) breeding and selection have been directed to the production of seedless varieties with desirable flesh qualities. The edible part of the fruit is derived solely from the female parent; only the seed carries the characteristics of both parents. Thus two flowers of Golden Queen peach, one fertilised by pollen from a nectarine and the other by pollen from another peach variety, will both develop typical Golden Queen fruits, though trees raised from the seeds might differ considerably.

With this outline as a background, the stages in the formation of mature fruit can be followed through, paying particular attention to those times at which failures are most likely to occur.

Failure of Tree to Blossom

The first and most obvious cause of fruit failure is when a tree does not blossom. This may be due to any one of several factors which prevent the formation of bud initials. Flower buds are differentiated from vegetative tissue early in the season preceding flowering. The blossom which appears in the spring was formed in the previous summer, but remained dormant in a miniature and telescoped form, protected by the bud scales throughout autumn and winter. The nature and amount of food material available at the time of differentiation have an important bearing on the number and type of buds formed. At this stage there is a considerable strain on the tree's resources, but a certain amount of food material is available from reserves stored in the tree, and more is being drawn from the soil and elaborated by the leaves, which are, however, not yet fully developed. On the output side, the current season's blossom has been produced, the young fruit is being expanded rapidly, and the woody parts of the tree are being extended. In general these functions have first call on the food material, and the number of fruit buds initiated is dependent on the surplus, particularly of carbohydrate. (Nitrogen in excess favours the formation of wood or leaf buds.)

Particularly in kinds of trees which bear on spurs, insufficient nutrition prevents buds from maturing properly,

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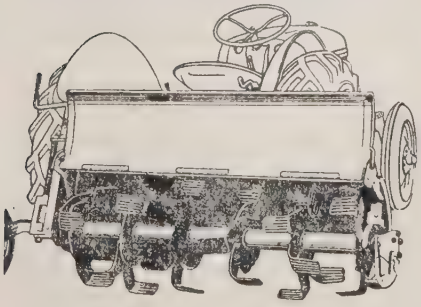

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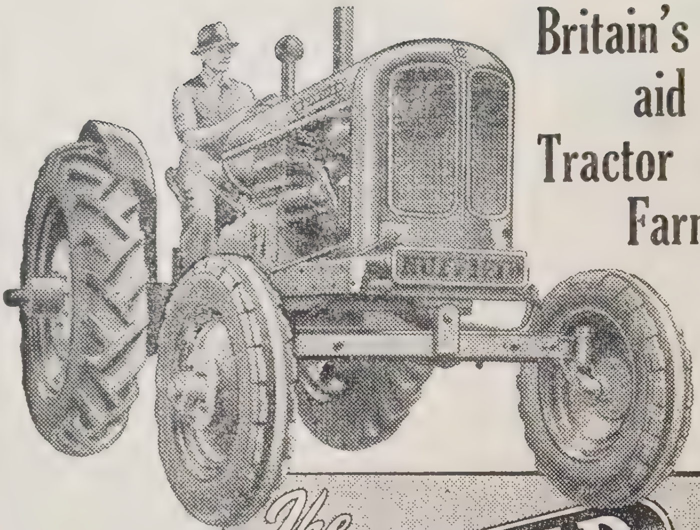

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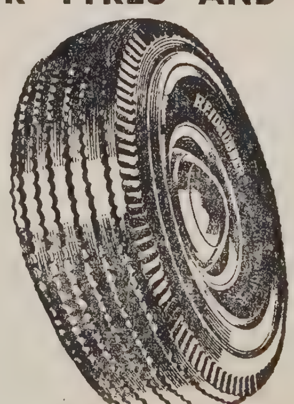

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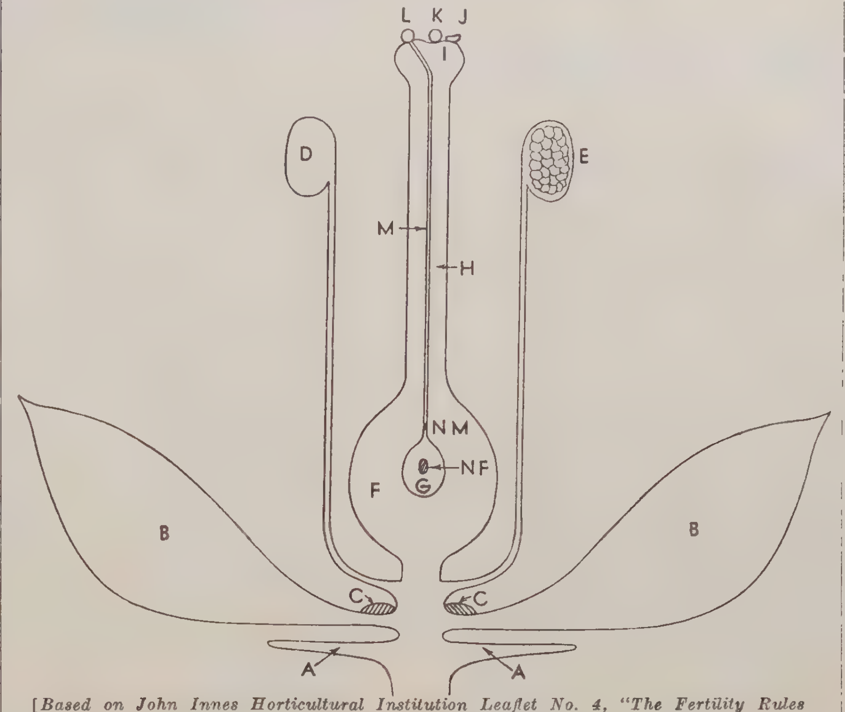
with the result that what appear to be fruit buds produce only a few leaves. Any cultural practices which increase the available surplus will assist in improving the potential crop for the following season. Ample plant food, including phosphate and particularly nitrogen, should be available at blossom time: Early thinning diverts material otherwise wasted, at least temporarily, into useful channels. In the case of spur-bearing trees showing promise of a heavy blossoming a drastic thinning out of old fruiting wood at the winter pruning serves the same purpose, particularly with apple and pear trees, especially where there is a tendency to biennial bearing (alternate heavy and very light crops). Certain varieties are very easily thrown into this cycle, especially after a crop failure such as is caused by a late frost.

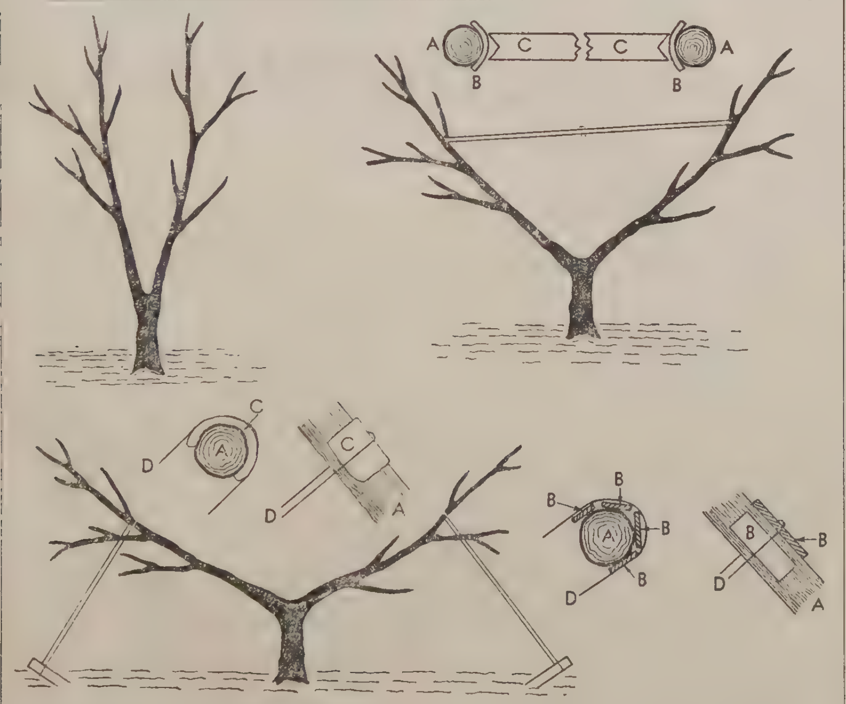


[Based on John Innes Horticultural Institution Leaflet No. 4, "The Fertility Rules in Fruit Planting".

Parts of a flower. A—Sepals (forming calyx). B—Petals. C—Nectaries. D—Anther. E—Pollen grains. F—Ovary. G—Ovule. H—Style. I—Stigma (sticky, retaining pollen grains). J—Pollen grain, weak. K—Pollen grain, healthy, but incompatible. L—Pollen grains, compatible, germinating. M—Pollen tube. NF—Female nucleus. NM—Male (pollen) nucleus.

Some varieties, particularly of peach and apple, form their fruit buds near the end of wood growths. If normal pruning is practised on these tip-bearers, most of the fruit buds will be cut off; thus the pruning must be modified so that growths carrying fruit buds are thinned out rather than shortened back.

Where trees grow vigorously and produce few or no flowers pruning should be light or it may be omitted for a season, while nitrogenous manures should be reduced or cut out altogether for a period. Upright wood tends to produce only vegetative growth, while branches which are horizontal or nearly so are more likely to form fruiting wood. This suggests several methods of reducing vigour and increasing fruitfulness, for example, the use of spreaders, tying branches down (taking care that ropes or wires do not cut through the bark), or pruning the leaders to laterals coming out at an angle rather than vertically. Root pruning and cincturing, or girdling, are sometimes suggested, but are not generally recommended.



Treatment of an unfruitful, upright-growing tree (top left). Top right—Treatment by spreading method. A—Branch. B—Padding (rubber, rag, etc.). C—Notched board. Bottom—Branches tied down. A—Branch. B—Cleats. C—Padding. D—Wire.

Root pruning may involve cutting the taproot where one is present, or merely removing a portion of the feeding roots with the object of reducing the tree's vigour. A great deal of work is necessary to expose sufficient of the root system, and it is difficult to judge the amount of roots that should be removed, avoiding the extremes of too light pruning, which will not be effective, and too heavy cutting, which weakens the tree too much, and may even kill it.

Girdling is done by removing a narrow ring of bark from the trunk or, preferably, from a few of the main arms, a process which, if successful, may be repeated on other limbs in subsequent seasons. The ring, up to ¼in. wide, may be removed completely; two half rings, an inch or so apart, which may or may not overlap, may be removed; or two or three cuts ¼in. apart, penetrating as far as the cambium, may be made round the limbs, leaving the bark in place. It is advisable to protect the wounds from disease organisms. Girdling should not be practised on stone fruit trees; it is sometimes effective on apple and pear trees, and is often successful on grape vines. It is only likely to succeed where the tree or vine is growing vigorously and is otherwise healthy:

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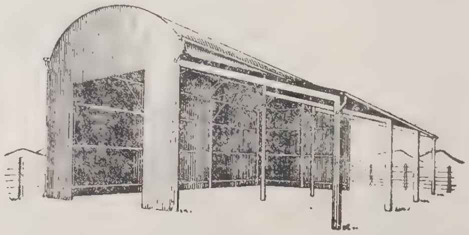

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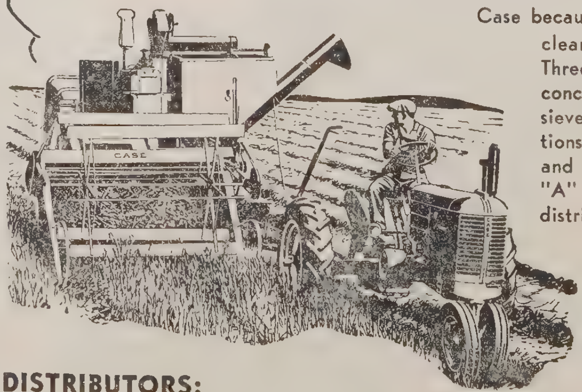

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it may do more harm than good on weak trees. Both root pruning and girdling, if attempted, should be done about a month before the buds are differentiated.

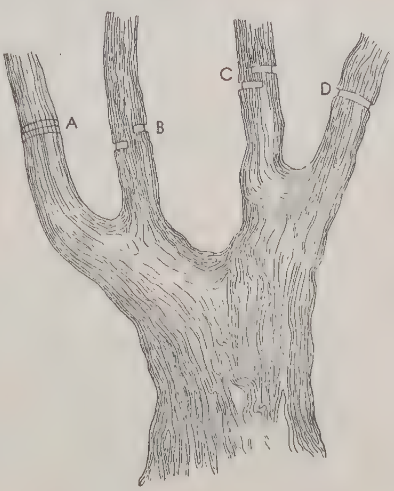
Reduction of leaf area through damage by weather, spray, or insects or disease will decrease the surplus material available for maturing healthy buds. Wherever practicable, good orchard shelter should be provided and a suitable spray programme followed. Flower bud formation is retarded by low, light intensity, so that little fruit is produced in the centre of densely crowded trees. For deciduous trees, the aim in pruning should be to develop an open-centred tree, with well-spaced leaders, so that all parts will receive maximum sunlight.

Usually some years elapse before young fruit trees come into bearing, but the actual period depends largely on the kind of tree, the stock in which it is worked, and the soil. Seedlings will usually take longer to bear than budded trees, while fertile soil tends to produce vigorous trees and to delay fruiting. Peach and nectarine trees will bear in the second or third year from planting, apple and citrus varieties may not produce much fruit for 6 to 8 years, while some pear varieties often take longer. It is not wise to encourage bearing too early, as this will tend to stunt the framework of the tree and permanently reduce the crop.

Dwarfing or semi-dwarfing stocks such as East Malling No. IX for apples, peach stock for some plums, and *Poncirus trifoliata* for citrus will encourage fruiting at an earlier age than such vigorous stocks as East Malling No. XII, cherry plum, and sweet orange respectively. Stocks also appear to have an influence on the time of blossoming, as a scion variety on one stock may bloom much earlier each year than the same variety on another stock.

The Flower

The flower, the next factor to be considered, is subject, sometimes even before it opens, to damage or destruction by birds, insects, fungous or bacterial diseases (brown rot in stone fruit and fireblight in apples), or by the weather. As far as frost is concerned, it appears that flowers will stand a lower temperature than the young fruit. In England in fruit-growing districts subject to late spring frosts experiments have shown that the application of certain hormones may delay flowering, so that the crop is susceptible to damage for a slightly shorter period. However, the incidence of exceptionally late frosts and the impossibility of accurate prediction reduce the possibilities of this discovery and also those of an alternative, the breeding of late-flowering varieties.



Types of girdling or cincturing. A—Scoring by making 3 parallel cuts ¼in. apart, not removing bark. B—Two half rings ¼in. wide, not overlapping. C—Two half rings ¼in. wide, overlapping. D—One complete ring ¼in. wide.

If winter temperatures, as distinct from short periods of cold weather in spring, are not low enough to break the rest period, buds may not open at the normal time or may even fail to open at all. This factor is at least partially responsible for the failure of fruits such as cherries, apricots, many English plums, raspberries, and currants to bear satisfactorily in northern districts with a mild winter.

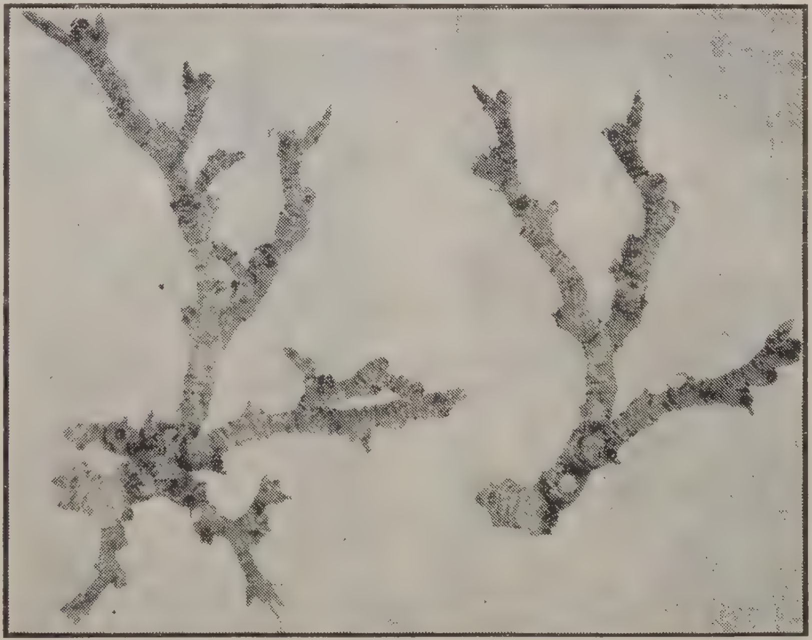
Many old trees, particularly apple and pear, make no new wood growth, but blossom profusely on old spurs each year, which often appears to exhaust the trees' reserves and no fruit is set. The best remedy for this is hard pruning, particularly a severe thinning out of the spur system and increased manuring, both of which will encourage young growth, so that in time healthy spurs and blossom capable of setting fruit will be produced.

Some kinds of fruit, for example, most peach varieties, will produce reasonable crops when fertilised by their own pollen, but the majority will bear better crops when pollen from another variety is used. With some kinds, cross-pollination is essential for fruit formation, even to the extent that only pollen from a restricted group of varieties is effective.

Pollination by Insects

On most fruit trees the flower parts are adapted for pollination by insects, of which the honey bee is by far the most important. To collect nectar or in some cases pollen bees travel from flower to flower, usually concentrating on a particular kind for a considerable period. In the collection of pollen by bees most of it is stored in the pollen basket, so that comparatively little is accidentally dropped or brushed off on to the stigmas of flowers visited subsequently. If the bee is concentrating on nectar, it takes no pains to remove pollen which clings to its hairy body, so that considerable quantities are transferred to other flowers. It is essential then to have sufficient bees in the neighbourhood of an orchard; usually one good hive to the acre of old trees is regarded as sufficient, while for younger plantations half the number may be enough.

Bees will not work satisfactorily in cold, wet, or windy weather. These factors are normally outside the control of the grower, but efficient orchard shelter is of great benefit, both by



A crowded spur such as that shown on the left tends to produce much blossom but little fruit; it should be pruned as shown on the right.

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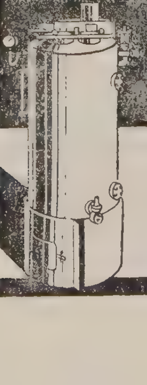

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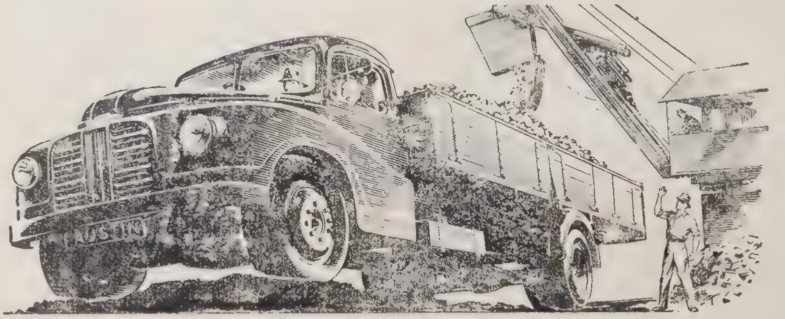

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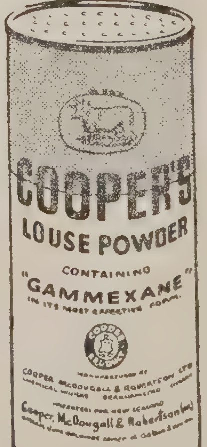

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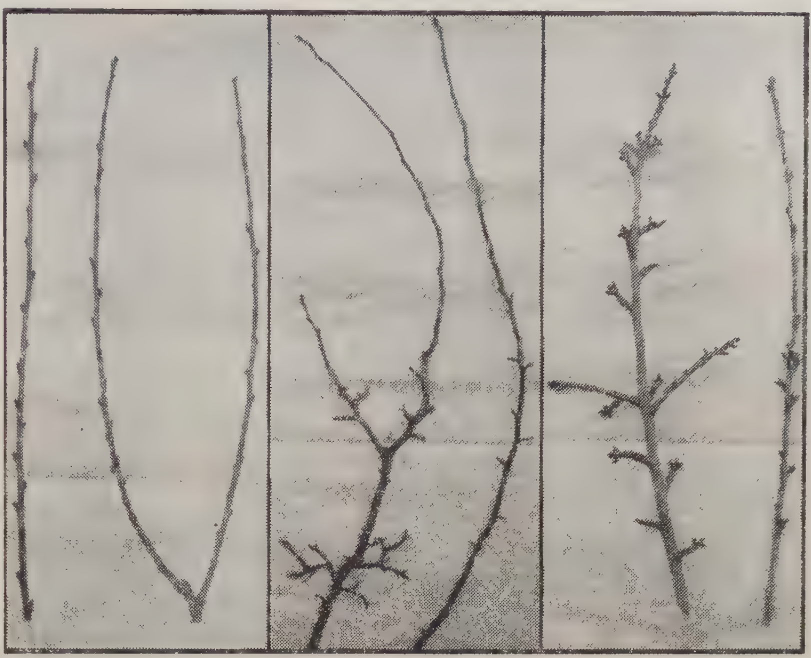


Left—Peach with fruit buds formed on current season's growth. Centre and right—Pear and cherry with fruit buds on spurs more than 1 year old.

lessening wind damage to the blossoms and later to the fruit, and by improving conditions for the bees.

Work done overseas has shown that nectar varies considerably in its sugar concentration and hence in its attraction to bees. Flowers which have nectar with a low sugar content are neglected, even when there is little or nothing else available. There is evidence that sugar concentration varies with variety, and that both temperature and humidity of the air have a definite effect. A rise in temperature or a decrease in atmospheric humidity will tend to concentrate the nectar and make it more attractive. It is possible, too, that manurial treatment has some effect on the composition of the nectar.

The Pollen

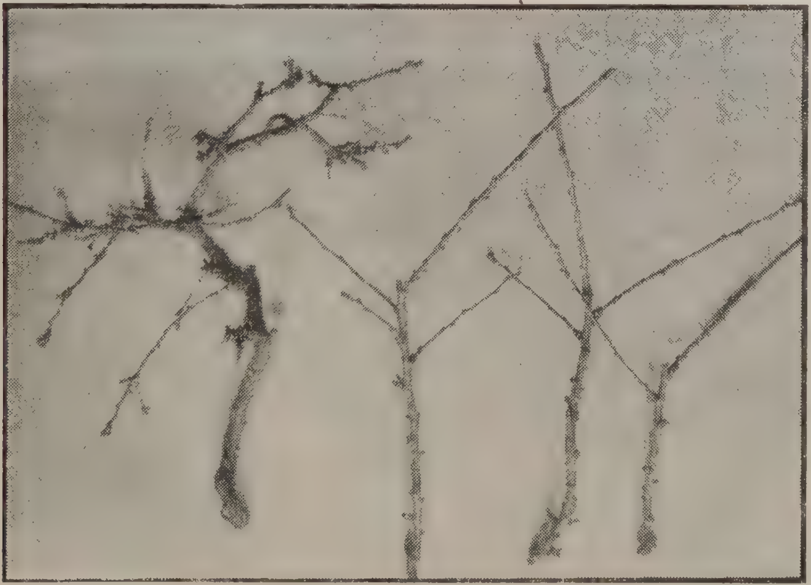
Pollen from one kind of fruit will not fertilise the ovules of another kind, for example, plum pollen is not effective on apples. (An apparent exception is in the case of nectarines and peaches, which are cross-compatible, but the nectarine is really a particular type of peach—a smooth-skinned sport.) However, as bees concentrate on one kind of flower at a time, it is usually the appropriate type of pollen which is transferred. A complication may arise in that sometimes the period over which the pollen is shed from the anthers does not coincide with the time at which the stigma is in a proper state to receive it, but as the flowers on a particular tree do not all open at the same time, there is usually sufficient overlap to ensure pollination. Normally, only a comparatively small percentage of the flowers need to be fertilised to give a commercial crop.

Quite a few failures occur, however, when a variety is self-sterile, that is, when its ovules are not effectively fertilised by its own pollen, and pollination by another variety is necessary. A self-sterile tree or block of trees which is so isolated from other varieties that no suitable pollen is available will rarely produce fruit. Where such a condition exists there are three methods of rectifying it, of which the most effective is to plant a tree or trees of a suitable variety close enough to enable cross-pollination by bees. As this may be impossible in a restricted area, an alternative is to work over a branch of the existing tree with the required pollinator. Both of these methods will take some years to become fully effective. As a temporary expedient, bunches of flowering wood of a pollinating variety can be placed in jars or tins of water close to the tree, though it is better to have the bunches placed fairly high, either hung in the upper branches or placed on the top of a ladder. If they are on the ground or low in the tree, bees will not visit them so readily.

When blocks of varieties known to be self-sterile are being planted, suitable pollinators should also be planted so that no tree is more than two or at most three rows away from one of the other variety.

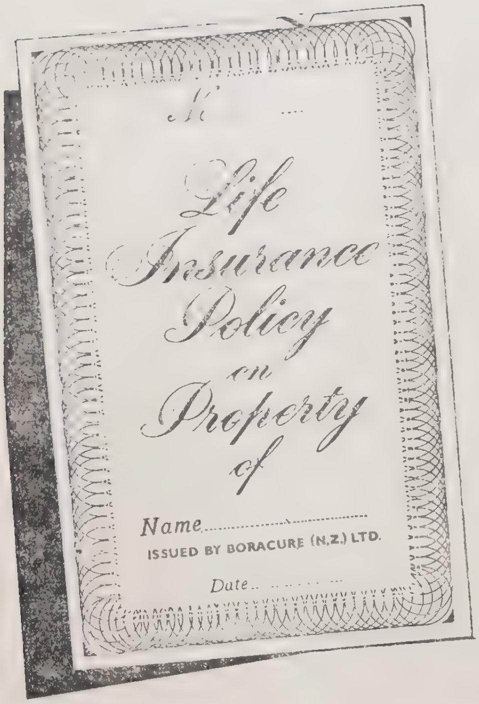
Not all pollen is fertile; some, because of its hereditary constitution, has a very low percentage of germination and usually dies before a pollen tube is formed. This is particularly the case with triploid varieties, which have three sets of chromosomes or carriers of hereditary material instead of two sets as in the normal diploid varieties. Examples of triploid varieties are the Gravenstein apple and its sports, Albany Beauty and Oratia Beauty, and the pears Beurre Diel and Vicar of Winkfield. Peaches are generally self-fertile, but the variety J. H. Hale (The Million-dollar Peach) produces weak pollen and should not be planted by itself. Carman and Elberta appear to be satisfactory pollinators for this variety, provided their blossoming periods overlap that of J. H. Hale, and this is dependent on environmental conditions.

Apart from inviable pollen, there is a type of sterility due to the occurrence in both pollen and the stigma tissue of a hereditary sterility factor. The mutual repulsion which is set up varies in degree; in some cases pollen carrying such a factor will not germinate on a stigma which also carries the



[*Green and Hahn Photography Ltd. photo.*

The spur on the left is almost exhausted. The younger ones on the right will produce better-quality fruit.



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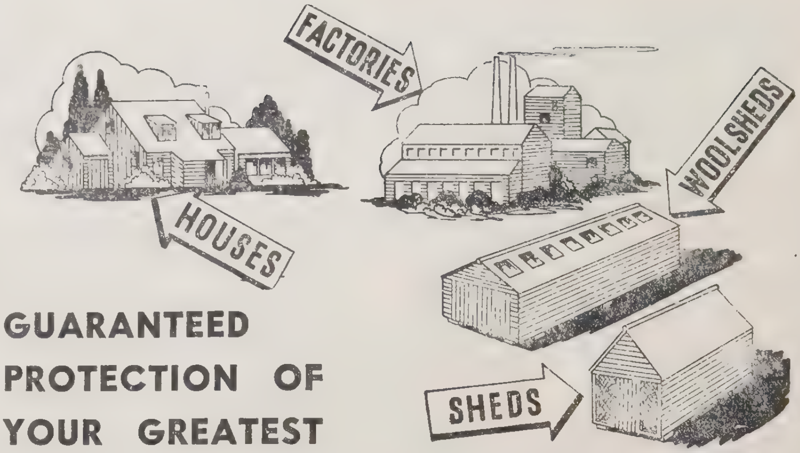

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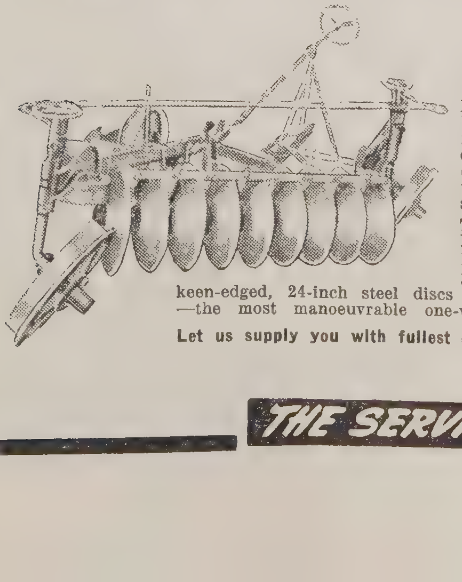

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same factor; in other instances the pollen grain germinates, but growth of the tube down the style is so slow that the flower withers and dies before the tube reaches the ovule. As most fruit trees are propagated vegetatively, that is, by cuttings, budding, or grafting, all trees of one variety are really parts of the original plant, and will all carry the same hereditary characteristics. Hence, if a flower cannot be successfully self-fertilised, the pollen from any tree of the same variety will also be useless. Sometimes this incompatibility extends to a group of varieties which have all inherited the sterility factor from a common parent. In cherries, for example, there are 12 groups of varieties; pollen from a variety included in any one of these groups is ineffective in fertilising any variety within that group, including itself, while pollen from varieties outside the group will be successful. Usually compatibility is reciprocal, that is, if variety A will fertilise variety B, B will also fertilise A, but there are exceptions.

It has been suggested that fertilisation releases a hormone which induces the growth of the fruit. However, a certain amount of growth will take place without fertilisation. Peaches, for example, may grow to the size of walnuts and then for no apparent reason drop off. Though in some cases this may be caused by a temporary lack of nitrogen at a vital stage of growth, it is often found that the kernels are imperfect, showing that the ovules have not been fertilised. In apples and pears, where the normal complement is 10 seeds, 2 in each of 5 compartments, fruit will often form where only 3 or 4 seeds have been produced, though usually these fruits are misshapen, failing to grow normally on the side where seeds are missing. Such fruits are very liable to drop prematurely.

In a few instances there may be complete parthenocarpy, that is, production of fruit without the ovule or ovules being fertilised, and hence seed formation. A few varieties of pears act this way, also navel oranges, seedless grapefruit, bananas, etc. The banana rarely forms seeds, but the so-called seedless citrus varieties quite often do so when grown close enough to seed-producing varieties to allow cross-pollination.

This parthenocarpic condition can be induced in tomatoes by synthetic fruit-setting hormones, which, if applied after natural pollination has failed, will produce fruit which is practically normal except for the absence of seeds. So far, no commercially practicable method is available for such treatment of tree fruits, though English experiments suggest that a natural hormone, extracted from apple pips at a certain stage of their development, may be effective on pip fruits. Though not directly connected with this topic, it is interesting to note that the natural dropping of apples, due to maturity, can be delayed considerably by the use of synthetic hormones. This treatment is now past the experimental stage and is being used commercially on certain varieties with good results.

Intensive pollination studies have been undertaken overseas, but, apart from information as to inter-sterile groups, not a great deal of the data obtained are immediately applicable to New Zealand conditions. Because of differing climatic factors, there is considerable variation in blossoming dates, and in any case many of our varieties are not grown to any extent overseas, while many on which work has been done in other countries are rarely grown here. There are differences also between the various districts in New Zealand, and for information as to suitable pollinators it would be wise to seek the advice of experienced local growers or of the nearest Orchard Instructor of the Department of Agriculture.

Superphosphate Bags as Mulch for Strawberry Bed

A HAWKES BAY fruit grower who was able to obtain a large number of superphosphate bags at a very low cost has put them to an unusual use as a mulch for a strawberry bed. The grower has an area of strawberries planted out in single rows sufficiently wide apart to allow the superphosphate bags to be laid end to end between rows and leave a space of about 6in. wide for the plants.

The soil is sandy in the area and irrigation is done by the sprinkler method. Advantages are that the bags prevent the sand splashing on to the fruit to any extent, the water is able to soak through readily once the bags become wet, moisture is retained in the soil, and weed growth is eliminated.

The grower has made staples of fencing wire to pin the bags together, but though this makes a more secure job, it may not be necessary if time is a limiting factor.

—*R. I. JUNE, Orchard Instructor, Department of Agriculture, Hastings.*

Even after a tree has blossomed and fruit has set several agencies may reduce or destroy the crop. Possibly the most important of these, at least in southern districts, is frost damage. A great deal of work has been carried out on this aspect of fruit production, but at the moment there appears to be no satisfactory protection on a commercial scale, except by the use of fire pots. Two long-term solutions which are possible are the breeding of varieties resistant to frost damage and the confining of future plantings to areas known to be free from late frosts.

Supply of Soil Moisture

Another point which must be considered is the supply of soil moisture. All plants require water, but an excess is likely to be as harmful as a deficiency. Roots must have air, and if the soil becomes waterlogged for any length of time, the soil air is replaced by water and the roots die. In severe cases the tree may be killed outright, but it may happen that sufficient roots are left to maintain the tree through the blossom and fruit-set stage, and allow the formation of some foliage. Later the reduced root system becomes incapable of supplying the full requirements of the tree and the fruit falls, though possibly the tree may survive in a greatly weakened condition.

In an overdrained soil an early dry spell may so reduce the available water supply that the tree cannot continue to carry its crop, which is often shed before much effect is noticeable in the foliage. In such soils it may be necessary to irrigate, but a more satisfactory solution is the improvement of the water-holding capacity of the soil by incorporation of plentiful organic material and the reduction of competition by weeds.

In stone fruit varieties there is a critical period in the expansion of the fruit, when it temporarily stops swelling, but internal changes including the hardening of the stone are taking place. Any shortage of food material, particularly nitrogen, at this time is likely to result in the shedding of the young fruit.

Damage by diseases and insect pests should, of course, be guarded against. Information on spraying is contained in the Department of Agriculture's bulletins "Control of Orchard Diseases and Pests by Spraying" (No. 161) and "Home Orchard" (No. 310), or may be obtained from the nearest Orchard Instructor of the Department of Agriculture.

In view of all the factors involved, it may seem remarkable that any fruit at all reaches maturity, but apart from uncontrollable factors such as weather, reasonable crops can be assured by attending to a few essentials. The first essential, of course, is to select varieties which are known to be self-fertile, or those which are cross-fertile, with overlapping flowering periods. Most varieties of peaches, nectarines, and apricots are self-fertile, but even with these, better crops are often harvested from mixed plantations than from solid blocks of one variety. Most apples and pears and many plums require cross-pollination.

The soil and situation should be suitable for the particular kind of fruit; frost pockets should be avoided, and it is wise to attend to shelter and drainage well in advance of planting, as well as improving the soil texture and fertility where necessary. The trees should receive reasonable attention in the way of manuring, spraying, and pruning. The aims in pruning should be first to develop a sturdy framework of a convenient shape for working, then to encourage fruiting wood, and thereafter to keep a balance between fruiting and vegetative growth so that the fruit growth is regularly replaced as it becomes weak. Early thinning is an important factor in keeping the cropping habit regular, and the timing of manure applications, as well as their type and amount, must be studied. Finally, it is almost impossible to produce fruit in the absence of bees.

◆

CARE OF LIVESTOCK DURING APRIL

Contributed by the Animal Research Division.

CARE OF CALVES

THE best way to prevent calves dying during winter is to treat them properly during autumn. They should never spend more than 2 or 3 days in one paddock, and should be rotated ahead of the cows through the best paddocks available. Good-quality hay should be provided for them daily, especially when the feed is growing fast after autumn rains. At the first sign of scouring they should be drenched with phenothiazine.

* * *

DRYING OFF DAIRY COWS

A dairy cow requires a reasonable spell between lactations, and should be dried off at least 6 weeks before she is due to calve. This should be done even if she is still milking heavily. The drying-off process need not be prolonged: it is quite safe just to stop milking, provided any quarters affected with mastitis are treated with the usual course of 3 tubes of penicillin, the last tube being given after the cow is milked for the last time.

* * *

AUTUMN-SAVED PASTURE

Early-calving cows are nearly always short of feed during July and August, and often during September. In most seasons pasture is not growing fast enough during these months to meet the requirements of milking cows. Crops are expensive to grow and concentrates are even more expensive to buy. It costs nothing, however, to shut up pasture in the middle of April and let it grow for use in early spring. About a sixth of the dairy area should be shut up in this way. Full instructions regarding the best paddocks to spell and the best method of feeding the autumn-saved pasture by the use of electric fences will be found in an article in the February, 1949, "Journal".

* * *

DECEMBER-FARROWED PIGS

Litters farrowed in December should be sold as pork. If they are carried on to bacon weights, no milk will be available for the later litters, which will have to be sold cheaply as stores or wintered on expensive concentrates. Available root crops may be fed to sows, but they require supplementing with milk or meat meal.

* * *

CARE OF EWES

If rams remain with the ewes for more than 4 weeks, they should be raddled on the brisket so that the late lambing ewes can be drafted off. Once the ewes are in lamb the level of feeding should be lowered to prevent their becoming too fat. By increasing the rate of stocking during autumn some paddocks can be shut up and pasture allowed to grow for grazing during the 3 weeks before lambing. These measures will greatly assist in reducing "sleepy sickness", which is most prevalent in fat ewes which are inadequately fed just before lambing.

* * *

CARE OF LAMBS

If the summer and autumn have been wet, lambs are likely to be suffering from worms. Drenching with phenothiazine 2 or 3 times at 3-weekly intervals will help. This applies particularly to the tail of the flock, which should be drafted off for special attention. Feed, however, is the most important consideration. During autumn lambs do best if grazed on pastures which have been allowed to grow to a height of about 6in. Hay aftermath and red clover are both very good. If these are not available, the lambs should be distributed thinly over the dairy paddocks or on hill pastures. They should on no account be concentrated in large numbers on short, rapidly growing pastures, especially if these have previously been grazed by ewes and lambs.

* * *

THISTLE POISONING OF CATTLE

Serious mortalities have been reported when hungry cattle have been grazed in paddocks very heavily infested with winged or variegated thistles. If it is not possible to cut and remove these from the paddocks, care should be taken to see that hay or other food is available so that the thistles do not constitute a large proportion of the diet. If any cattle grazing in infested paddocks are found to be distressed and breathing heavily, all the cattle in the paddock should be very quietly moved into a clean paddock, and veterinary aid should be enlisted immediately. Fuller details will be found in an article entitled "Nitrite Poisoning in Cattle and Pigs", published in the April, 1947, issue of the "Journal".

* * *

TUBERCULOSIS IN POULTRY

Tuberculosis not only causes considerable loss in poultry, but it frequently spreads to pigs, with consequent condemnations at the meat works. If this disease is suspected, veterinary aid should be sought with a view to eliminating affected birds.

* * *

RED WORMS IN HORSES

Red worms can seriously reduce the efficiency of working horses, and are responsible for many deaths in foals. Phenothiazine is a very effective remedy, but is best given under veterinary supervision, as, in certain conditions, it may prove dangerous. Treatment should be administered before winter.

Soils and Fertiliser Responses in Franklin County

By J. E. BELL, Fields Superintendent, Department of Agriculture, Auckland.

FROM 1929 to 1940 many topdressing experiments were carried out in and around Franklin County. Lime and potash were applied to pasture on pegged plots and results were judged by observing improvements in the pasture. The changes in pasture composition which were noted and accepted as improvements were outlined in the article "Improving Pastures in Auckland Province" which appeared in the April, 1948, issue of the "Journal".

LIME was applied usually at 1 ton per acre at laying down and thereafter annually at 5cwt. per acre and potash in the form of 30 per cent. potash salts at 2cwt. per acre annually. These were recognised as heavy dressings and were applied purposely to discover if there was any response to these substances. It was thought that if no results were secured, it could be assumed that they were not required; if responses were obtained, smaller or larger applications could with benefit be applied according to the degree of response, pending the laying down of trials to determine the exact quantities for economical use.

The lime and potash were applied in varying combinations with or without phosphate. In some trials the treatments included phosphate alone, lime alone, potash alone, lime and potash, lime and phosphate, potash and phosphate, and lime and potash and phosphate.

Land Classification

For this survey Franklin County has been divided as follows:—

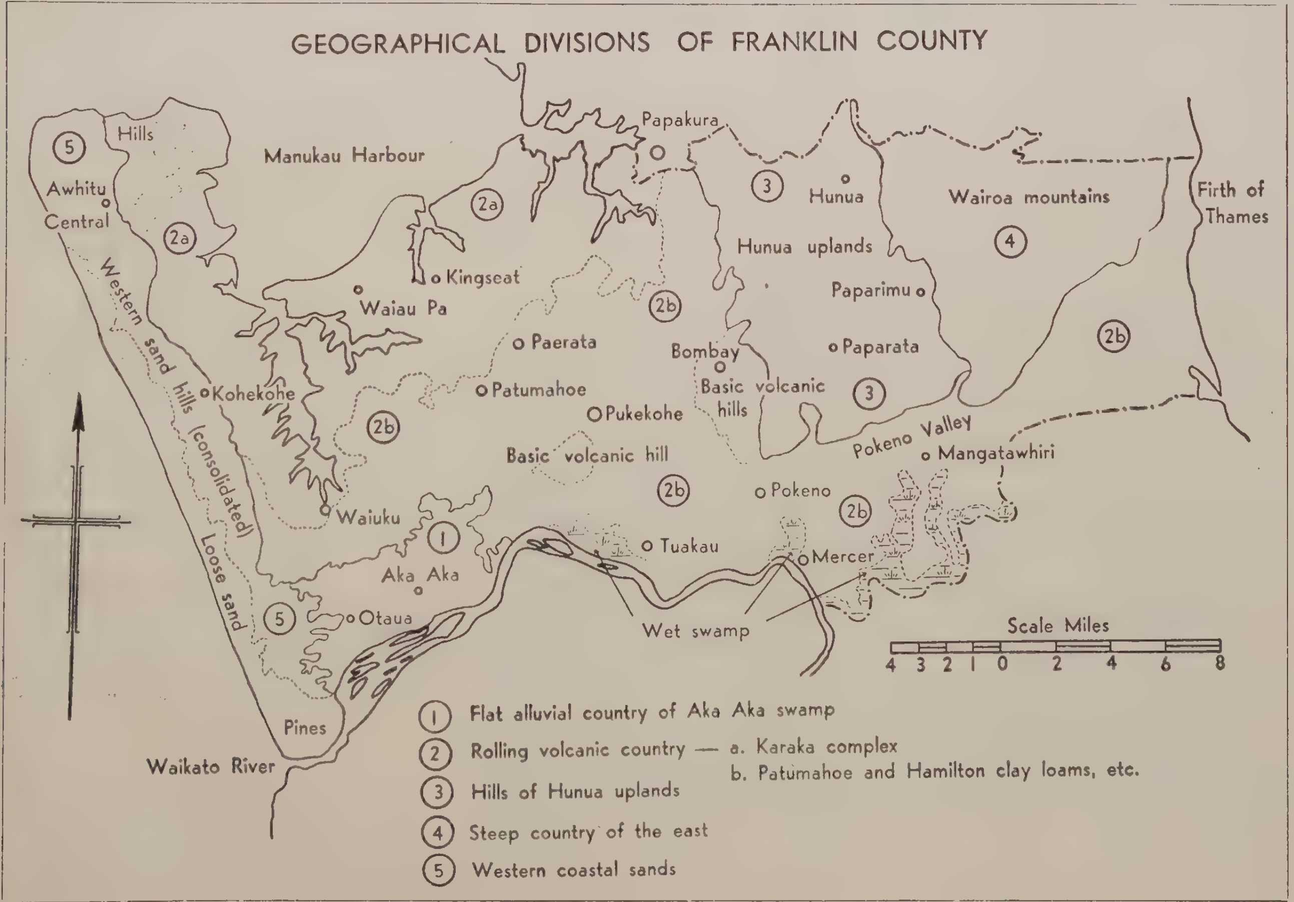
1. Flat alluvial land of the Aka Aka swamp.
2. Rolling volcanic country.
3. Hills of Hunua uplands.
4. Steep country of the east.
5. Western coastal sands.

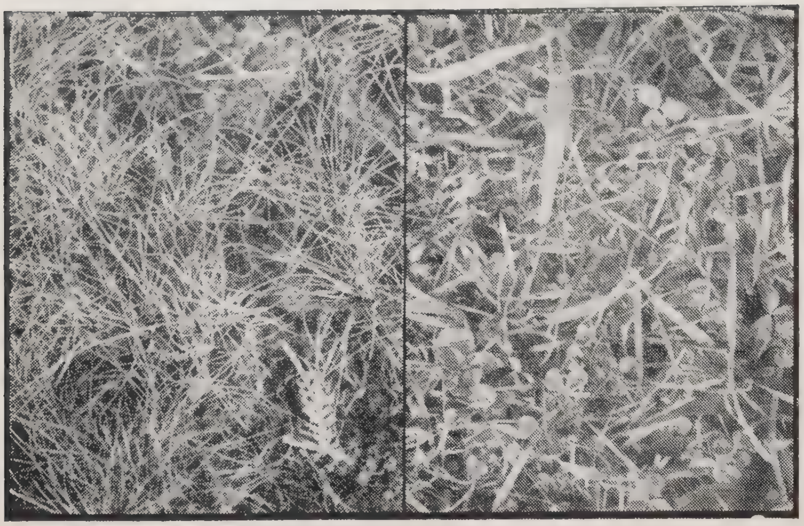
1. Flat Alluvial Land of the Aka Aka Swamp

The soils (Aka Aka peaty silt loam and loam) in this region are mainly derived from finely divided pumice brought down and deposited by the Waikato River. Originally the country was wet and clothed with kahikitea forest, cabbage trees, flax, and raupo. It had to be drained to carry away the run-off from the high land and stop-banked and flood-gated to keep out the Waikato River, and in places flood pumps were installed to assist drainage. Rotary-screw pumps designed and chiefly manufactured by a local farmer were used successfully to pump water from properties into the large roadside drains on their way to the Waikato River. So from an area inhabited by ducks and swamp hens, prosperous farms developed which were devoted mainly to production of milk for cheese manufactured in two factories located in the area.

Other difficulties which the farmers had to face were the invasion of pastures with tall fescue, introduced by one or two settlers, and the lack of windbreaks. Tall fescue is still a problem on some farms, but is being eradicated by cultivation and cropping. Pampas grass and New Zealand flax and trees were tried out to provide shelter, but these have given place to bamboo, which affords excellent shelter. Not all of the soils were alluvial

GEOGRAPHICAL DIVISIONS OF FRANKLIN COUNTY


Papakura
Manukau Harbour
Hills
Awhitu Central
Western sand hills (consolidated)
Loose sand
Kingseat
Waiau Pa
Paerata
Patumahoe
Pukekohe
Kohekohe
Waiuku
Aka Aka
Otaua
Pines
Waikato River
Basic volcanic hill
Tuakau
Wet swamp
Mercer
Pokeno
Pokeno Valley
Mangatawhiri
Bombay
Basic volcanic hills
Hunua
Hunua uplands
Paparimu
Paparata
Wairoa mountains
Firth of Thames
Scale Miles
4 3 2 1 0 2 4 6 8
1
2a
2b
3
4
5
① Flat alluvial country of Aka Aka swamp
② Rolling volcanic country — a. Karaka complex
b. Patumahoe and Hamilton clay loams, etc.
③ Hills of Hunua uplands
④ Steep country of the east
⑤ Western coastal sands



Left—Natural pasture from scrubland, chiefly sparse *Danthonia semiannularis*, capable of carrying about ½ a dry sheep per acre. Right—The same land as at left well topdressed with phosphate and lime. It is carrying a ryegrass-white clover-paspalum pasture with a trace of cocksfoot and is capable of producing 200lb. of butterfat per acre or 5 ewes and some cattle.

pumice, for toward the hills there are pockets of peat which have developed more slowly.

On the alluvial soils and where the peat was shallow there was little need for applications of fertiliser and lime. Only one topdressing trial has been located in this area on a peaty phase, and this has shown little or no response to treatments with phosphate, lime, or potash. It would appear that only small applications of fertiliser are needed, but more trials would be required to decide this point.

The pastures on the swamp comprise ryegrass, white clover, paspalum, and Yorkshire fog as the main constituents. They are highly productive and maintain this production over dry summer and early-autumn months. In wet seasons summer growth is difficult to cope with. None or very few of the stock suffered from the violent eczema outbreak which affected stock on the rolling country nearby just before the Second World War.

2. Rolling Volcanic Country

Rolling volcanic country comprises by far the greater part of the productive area of the county. It can be divided into two distinct divisions according to topography, soil type, and original plant cover. The area to the south is slightly elevated and was mainly in bush comprising taraire, puriri, and totara. Arising out of the elevated country are basalt volcanic cones. On and close to these cones, soils which are very fertile were formed from the lava flows. These soils are eminently suited to market gardening to which they are largely devoted as well as to small dairy farms. In between the volcanic cones the soils were from ash showers forming the Patumahoe, Bombay, and Hamilton clay loams, with some clays. Of these the Patumahoe clay loam is more fertile. At times these soils are used for market gardening, but the chief use is dairying, with odd farms devoted to fat-lamb production and cattle fattening. The farms on the volcanic cones range from 5 to 15 acres and are used for dairying or market gardening or a mixture of both. On the ash soils the dairy farms range from 15 to 80 acres and market gardening is more usual on a portion of the smaller of these farms. There are, however, some 20-acre farms used successfully for dairying only. The climate is mild with ample rains except in summer when dry weather frequently parches the ground and causes reductions in yields of pasture and crops. Frosts are light and are seldom experienced on the elevated cones.

The country to the north and bordering the Manukau Harbour is low lying and was originally mainly in scrub. The soils are formed from volcanic ash chiefly water sorted, forming loams of various textures. The chief soil type is the Karaka complex, which occupies almost the whole of this area. The country is devoted mainly to dairying, but there is a considerable amount of country producing fat lambs and cattle. The dairy farms in this area are from 80 to 150 acres and the sheep farms from 200 to 500 acres. Some of the dairy farms closer to Auckland supply whole milk to the city of Auckland, but the others supply cream for butter manufacture.

This area is more subject to dry weather in summer than the elevated country to the south and frosts are more severe.

The pastures did not last on the elevated country before topdressing began and on the Karaka complex soil very little development was possible. On the elevated country a short rotational cropping system was therefore adopted by the early settlers, who grew grain and other food for themselves, their stock, and the growing town of Auckland. The introduction of refrigeration and topdressing has changed the farming system to a state where permanent leas are the rule with very little land broken up for crops. Grain and other similar foodstuffs are now brought in from other centres, while the farmers in the district concentrate on livestock farming, the main type being dairying. By the manuring of the run-out fields of browntop and ribgrass the majority of the fields of today have been produced. These fields vary in productivity according to management and the kind and amount of fertiliser that has been applied. Many have high-class swards of ryegrass, white clover, paspalum, and cocksfoot, while in others browntop and ribgrass are still prevalent. Other common pasture species are *Poa pratensis*, *Poa annua*, suckling clover, subterranean clover, scotch thistle, buttercup, ribgrass, and common field daisy.

Topdressing began in earnest this century, and except during the depression and the Second World War the increase in the practice has been steady and the cost of fertilisers must now be about £100,000 per annum in this intensively farmed area. No doubt there is need for careful watching of this expenditure; it is necessary for farmers to know not only what fertiliser to apply but how much to use.

Trials have shown that there are likely to be three materials deficient on this country; namely, lime, phosphate, and potash. The cheapest available supply of lime is from ground rock lime. Phosphatic fertilisers include bonedust, superphosphate, basic slag, Heskett slag, and raw rock phosphates (North African rock phosphate and Nauru and Seychelles guano). Potassic fertilisers include kainit, 30 per cent. potash salts, muriate of potash, and sulphate of potash.

Nitrogen is also deficient, but this deficiency is made up by encouraging clover growth by the use of one, two, or all three of the materials lime, phosphate, and potash.

The abundant supply of any one of these materials will not overcome a deficiency of the others. Thus in a soil well topdressed with lime and phosphates poor results will be secured if there is a great deficiency in the soil of potash, and in a soil deficient in lime phosphate only will not give good results, and better results will usually be secured from basic slag and rock phosphate than from superphosphate. Supply the lime and then superphosphate will give good results.

Lime, phosphate, and potash all bring about improvement in the sward in the same manner; that is, improvement in growth of clover, with the resultant smothering of weed growth and improvement in vigour and growth of pasture grasses, particularly of the more highly productive species.

Since phosphate has been used extensively on pastures in this area, there has been no great need to test the value of phosphate, but there has been need to test the value of lime and potash which at the time the trials started had been used comparatively

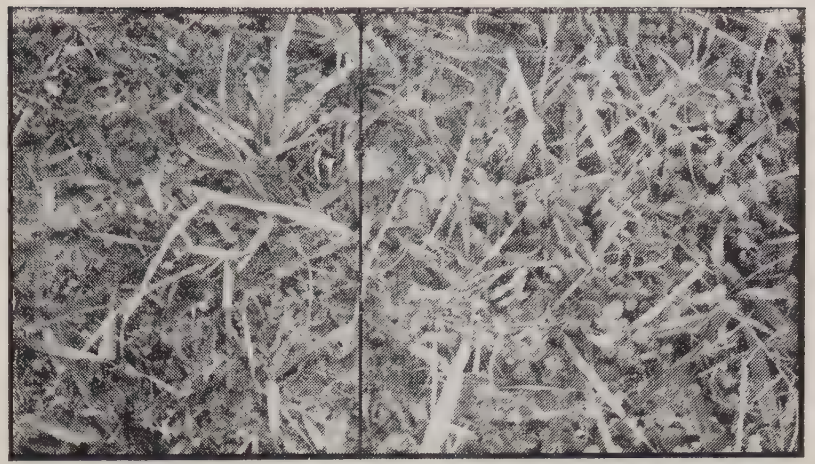
TABLE 1

Tabulated below are results from the use of phosphate plus lime over phosphate and from phosphate plus lime plus potash over phosphate plus lime.	**Improvement due to Lime** (Lime plus phosphate over phosphate)	**Improvement due to Potash** (Potash plus phosphate plus lime over phosphate plus lime)
1. SOILS FORMED FROM BASALT		
Red-brown Loams		
Stuart, N., Pukekohe	Not tried	Nil
Motion, I. A., Pukekohe	Nil	Nil
Wilkinson, F., Pukekohe	Very slight	Nil
2. SOILS FORMED FROM VOLCANIC ASH SHOWERS		
(a) **Patumahoe Clay Loam**		
Hirstich, F., Patumahoe	Slight	Slight
Willis, C., Mauku	Nil	Slight
Davies, W. F., Mauku	Nil	Slight
Morgan, L., East Pukekohe	Not tried	Nil
Morgan, J. W., East Pukekohe	Slight	Nil
Sandford Bros., Tuakau	Fair	Not tried
Pritchard, Puni	Slight	Nil
Greet, T. A., Mauku	Slight	Slight
†Greet, T. A., Mauku	Very slight	Good
Hill, E. W., Mauku	Slight	Nil
Hill, E. W., Mauku	Good	Nil
Hill, E. W., Mauku	Slight	Not tried
Hill, A., Mauku	Slight	Very slight
Scanlen, W. G., Pukeoware	Very slight	Very slight
Wesley College, Paerata	Nil	Nil
Wesley College, Paerata	Good	Fair
(b) **Kapu Silty Clay Loam**		
Harkness, I. A., Waiuku	Slight	Slight
(c) **Bombay Clay Loam**		
Bingham, H., Bombay	Nil	Nil
Hunter, W. N., Bombay	Very slight	Nil
Hunter, W. N., Bombay	Fair	Not tried
*McKinney, J. B., Bombay	Good	Not tried
Melvern, M., Razorback	Very slight	Slight
(d) **Hamilton Clay Loam**		
†Jones, L., Rama Rama	Nil	Fair
†Mullions, F. M., Rama Rama	Nil	Fair
Clayton, E. A., Whangarata	Slight	Slight
(e) **Orere Clay Loam**		
Parker, F. R., Mangatangi	Fair	Not tried
(f) **Karaka Complex**		
Theyers, W. A., Runciman	Good	Fair
Pilcher, V. G., Patumahoe	Slight	Slight
Kendall, G. W., Glenbrook	Slight	Very slight
Howe, G. C., Karaka	Slight	Not tried
Mayhead, R., Waipipi	Slight	Not tried
Mayhead, R., Waipipi	Slight	Nil
Pearson Bros., Patumahoe	Slight	Nil
Cole, S., Waiau Pa	Slight	Fair
†Smith, Howard, Waiau Pa	Slight	Fair
Woolsey, A., Patumahoe	Slight	Slight
3. WATER-SORTED ASH, PEAT, AND SAND		
Koheroa Complex		
‡Jeffs, A. H., Mangatawhiri	Nil	Nil
4. FORMED FROM SANDSTONE		
Manurewa Clay		
Emson, A. C., Hunua	Slight	Slight
5. FORMED FROM SAND		
Pinaki Sand		
Aldred, A.	Very slight	Very slight

* Fields had had heavy sulphate of ammonia applications in growing potatoes.

† Fields cut frequently for hay or silage.

‡ Fields had received a heavy liming before the trial was laid down. The soil does respond to lime.



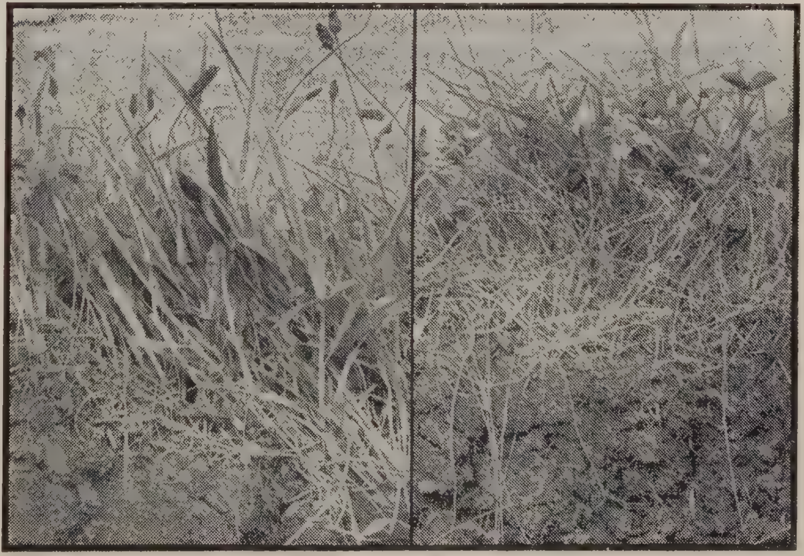
Left—Superphosphate plot on Patumahoe clay loam at Mauku, where potash deficiency has been induced by frequent cutting for silage. Right—Superphosphate plus potash plot, showing the marked effect of the potash on the clover growth and prevalence as compared with the pasture at left.

to a much more limited extent. The widespread deficiency of phosphate has been proved by the farmers, and information as to type and quantity to use is generally all that is required. A few trials to test the type of phosphate have been laid down, but examination of the effect of different amounts has not been attempted.

Response to Lime and Potash

The results given in Table 1 are from the use of phosphate plus lime over phosphate and from phosphate plus lime plus potash over phosphate plus lime. This really shows respectively the value of lime and potash, because the common farming practice has been to use lime in addition to phosphate where phosphate has failed to give adequate returns. If lime and phosphate fail, then as a rule potash used in addition or with phosphate only gives the desired results.

It is the opinion of the writer that applications of lime and potash are worth while, even though slight responses are shown. The trials were laid down in farmers' fields and subjected to the ordinary grazing treatment of those fields. Responses were noted in the improvement of the sward and judged accordingly. It is difficult for the eye to detect a field response below a 25 per cent. increase. Hence, with a slight response the improvement may be above 25 per cent. which, apart from the long-term effect, which is considerable, will pay for a considerable amount of fertiliser and even for the application of 1cwt. of muriate of potash or 2cwt. of 30 per cent. potash salts which were used annually in the trials. The responses



Left—No-manure plot on soil formed from water-sorted ash (new pasture). Right—Superphosphate plot on soil formed from water-sorted ash (new pasture).

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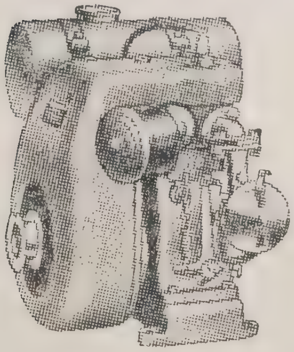

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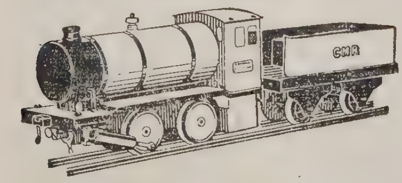

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Left—No-manure plot on soil derived from ash showers on a field cut continuously for hay. Right—Slag, lime, and potash plot in the same field as at left. Poor results were secured from slag and slag plus lime. On fields on the same farm not cut for hay both superphosphate applied by the farmer and slag in Department of Agriculture plots gave outstanding responses.

are also made more conservative because any improvement in fertility could not be transferred through the animal to the plots, but was distributed over the whole field or to another part of the farm.

Except on the soils derived from lava flows on the volcanic cones where nil or slight lime responses occurred and nil from potash, there were no material differences which could be ascribed to soil type. The remaining soils on which all the trials except two were placed were derived from ash showers of various kinds which are similar in structure and maturity.

It will be noted from the results given, and this has been demonstrated in trials in other districts, that potash deficiency is liable to show up in hay fields. Hay fields are liable to be exhausted of potash because much is removed in the hay carted and fed on to other parts of the farm. Fields near cowsheds and night paddocks are less likely to be deficient in minerals than those distant fields on which stock do not concentrate so much and which are more liable to be closed for hay and silage. The evening up of this fertility is desirable and could be brought about by making more hay and silage in fields near the cowshed and having less concentrations of stock at night on such fields.

Generally, nowadays, the phosphate and lime supply is adequate, in which case potash can be expected to be the limiting factor in run-out and poor fields. Potash is usually speedy in action and a topdresser strip of 1cwt. per acre of muriate of potash will usually tell its story in a few weeks. Potash should not be tried, however, until lime and phosphate have been given a fair trial with time to act. Lime is slow in action and the results are usually not at their peak until about 2 years after application. Lime responses are usually most noticeable in summer, while those from potash are more apparent in spring and following autumn rains.

3. Hills of Hunua Uplands

The hills of the Hunua uplands comprise in the main more mature soils which are more leached than those of the lower country. The main soil types are the Pukekauri clay and silty clay loam (hill soils), the Opaheka clay loam (hill soils), the Ararimu clay and silt loam, the Hunua clay and silt loam, and the Manurewa clay loam and clay (hill soils). The exceptions are Hunua Valley itself, Happy Valley, and the Paparata Valley, where the soils are mainly volcanic with one peaty area in Happy Valley. These sections come mainly under the section dealing with rolling volcanic soils. On the older soils of the hills farming in the main has failed and has followed the sequence of reversion following bush felling and grassing on the burns. The soils comprise grey clays formed from greywacke and brown and grey sandy loams formed from sandstone. Kauris were present in the bush and the soils are very deficient in lime; much more so than the volcanic soils. This has been demonstrated in trials on the same soils in the neighbouring Manukau County and elsewhere. Blackberry, ragwort, and rabbits are prevalent and no great attempt has been made so far to reconvert the area to pasture. It can be said to consist mainly of a wilderness of bush scrub and blackberry with areas here and there being developed by cultivation, sowing pastures, and topdressing existing swards.

4. Steep Country

The steep country (Te Ranga clay loam and stony clay) to the east of Hunua Valley is mainly in bush and scrub. Some steep hill country in pasture is devoted to the production of wool and store sheep, with isolated dairy farms on the easier slopes. The application of fertiliser and lime to this country is difficult and little attention has been paid to it. No trials have been laid down in this country, which is being largely taken over by the Auckland City Council as a watershed for the provision of a city water supply.

5. Western Coastal Sands

Behind the raw sand along the west coast of the country there is a strip of consolidated sand. The southern end of this strip is strongly rolling to rolling country. In the north, parts are steep and rugged. The soil (Red Hill sand and sandy loam and Pinaki sand) is fertile and responds to phosphate applications and very little to lime or potash. Except for the steep areas, which are in bush, scrub, and usually rough pasture containing much ratstail and cocksfoot, the country is clothed with good ryegrass-white clover-cocksfoot pastures and is devoted to dairying and fat-lamb production. The steep rough country is mainly used for sheep and cattle. No trials have been laid down in Franklin County on the consolidated sand.

The development of the raw sand alongside shows promise. Parts of it, particularly at the southern end at the mouth of the Waikato River, threatened to engulf the good country alongside, but were stabilised by the Ministry of Works by use of marram grass, and many acres following this have been planted in thriving pine trees. The remainder is in marram grass and lupins. Grassing is difficult and fertilisers and lime are not very effective on existing swards. These can be much improved by introducing subterranean clover followed by topdressing. Kikuyu grass introduced on to the raw sand makes great progress and produces more than any other type of pasture plant on these raw sands. It will colonise raw sand without having to follow the marram grass and lupin stages which are needed before other pasture species will grow. For better country kikuyu grass holds the same position as that held by paspalum 30 years ago. It is frowned on by many farmers who do not like it because of its vigorous nature and the difficulty of eradicating it if eradication is required. Kikuyu grass established on the raw sand threatens the consolidated country alongside. Where this is in good pasture, however, invasion must be slow, and by careful watching it can be prevented from establishing.

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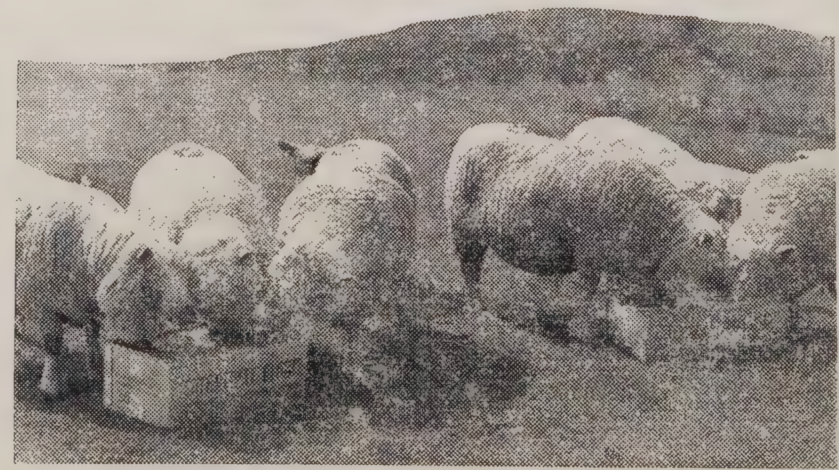

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POISONOUS PLANTS IN NEW ZEALAND

THIS is the sixth section of a series of descriptions of poisonous plants which grow in New Zealand by H. E. Connor, Botanist, Department of Scientific and Industrial Research, Wellington. The series is appearing monthly in the "Journal", and glossaries to be used with the series were published with the first section, which appeared in the October issue.

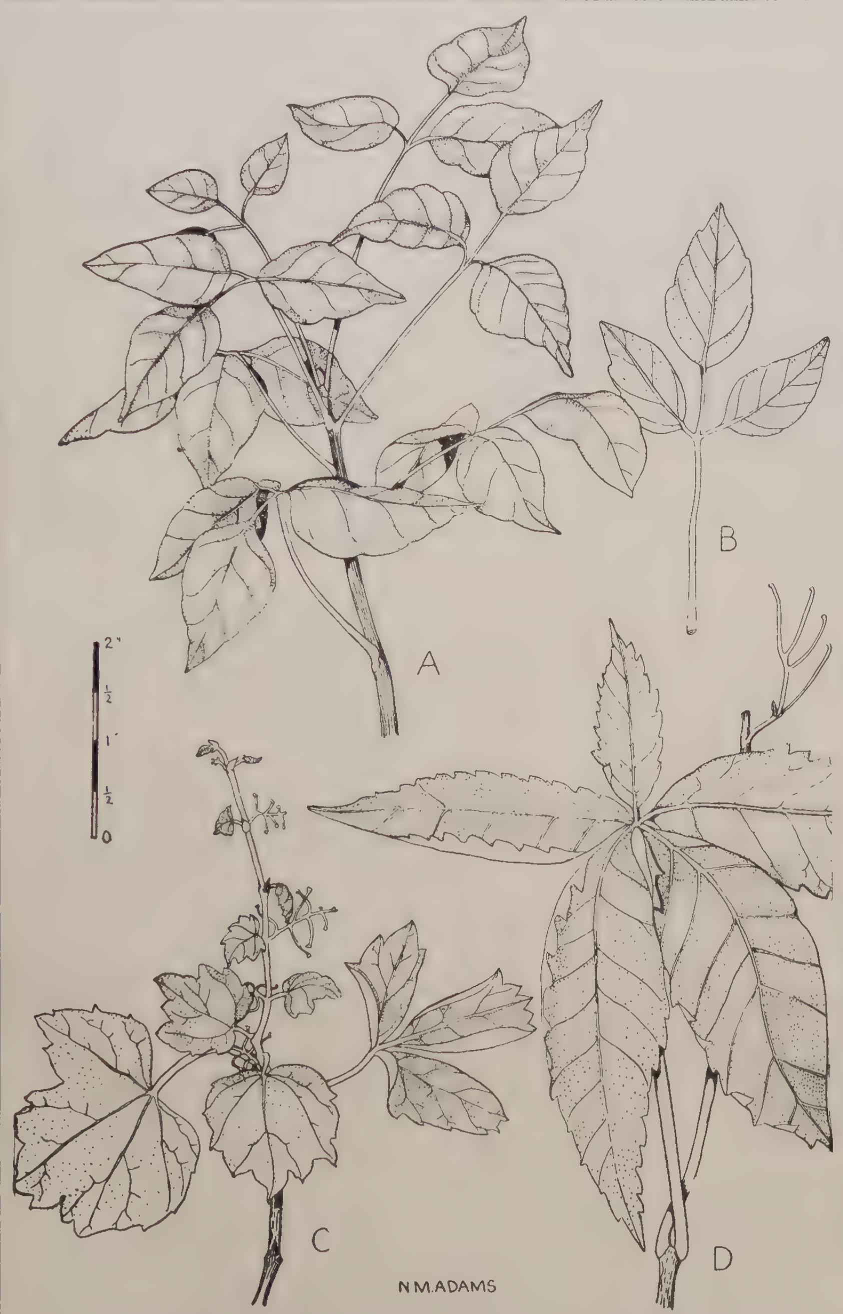

Fig. 12—A (habit) and B (leaf) of poison ivy *(Rhus toxicodendron)*. C: Boston ivy *(Parthenocissus tricuspidata)*. D: Virginian creeper *(Parthenocissus quinquefolia)*.

DICOTYLEDONS

Anacardiaceae

Poison Ivy. *Rhus toxicodendron* **L. (Fig. 12, A and B)**

Botanical description: Habit—Erect shrub, or vine climbing by aerial rootlets on fences, walls, or trees; stems woody, creeping from basal stem nodes. **Leaves**—Alternate, compound, with 3 leaflets; leaflets glossy or dull green, sometimes somewhat hairy, margins entire, toothed or lobed, ¾ to 4in. long. **Flowers**—In slender, open, axillary panicles ¾ to 3in. long; petals 5, green-yellow. **Fruit**—A small drupe, white or cream, dry, nearly globular, up to ½in. in diameter. (North America.)

Habitat: Cultivated.

Distribution: Known to be cultivated at Levin, Dunedin, and Christchurch, but may have greater distribution.

General: Poison ivy is well known to cause intense irritation to persons who come in contact with it. Contact with the poisonous juice of the leaves, bark, and flowers produces the typical poison ivy symptoms. There is probably no complete immunity to poison ivy, though it is claimed by some. Some authors assert that poison ivy is harmless to cattle and sheep, even though in experimental work with smaller animals deaths were induced.

Fig. 12, C and D, contrasts Virginian creeper (*Parthenocissus quinquefolia* Planch.) and Boston ivy (*P. tricuspidata* Planch.) with poison ivy.

Symptoms of poisoning are severe irritation, reddening, and blistering of the skin. Vesicles form and in severe cases fuse to cause blisters. Pus may be produced with the formation of scabs. Intense swelling of the face, which may spread to other parts of the body, is characteristic.

Poisonous principle: Urushiol, a slightly volatile oil present in all parts of the plant except the wood, hairs, and pollen grains, is thought to be the toxin.

Umbelliferae

Hemlock. *Conium maculatum* **L. (Fig. 13)**

Botanical description: Habit—Biennial herb; stems up to 6ft. tall, branching, hollow, and usually flecked or spotted with purple. **Leaves**—2 to 4 pinnate, leaflets lanceolate, pinnatifid. **Flowers**—Small, white, in compressed umbels of numerous rays. **Fruit**—With wavy, crenate ridges. (Eurasia and North Africa.)

Habitat: Waste places, roadsides, shady places, and gardens.

Distribution: Frequent to locally abundant throughout New Zealand.

General: Hemlock poisonings occur in stock from time to time in New Zealand, even though animals rarely eat the plant. All classes of stock are known to be poisoned by hemlock, and poisonings are more frequent in spring. All parts of the plant are toxic, the seeds especially so. Poisonings are also recorded in human beings, more especially in children, who may mistake the leaves of hemlock for parsley, chew the seeds, or make whistles or pea-shooters from the stems. Sub-lethal doses cause sickness in animals and flavour the milk of dairy cattle. Toxicity decreases considerably on drying.

Symptoms of poisoning: Hemlock is a narcotic plant. General symptoms in animals are salivation, bloating, bodily pain, irregular breathing, rapid, feeble pulse, and complete paralysis followed by death. Pregnant cows may abort. In man the symptoms are a general and gradual weakening of muscular power and sometimes loss of sight; death results from gradual paralysis.

Poisonous principle: The toxic volatile alkaloids coniine, methyl-coniine, coniceine, and conhydrine are present throughout the plant. Coniceine is considered the most toxic of the alkaloids.

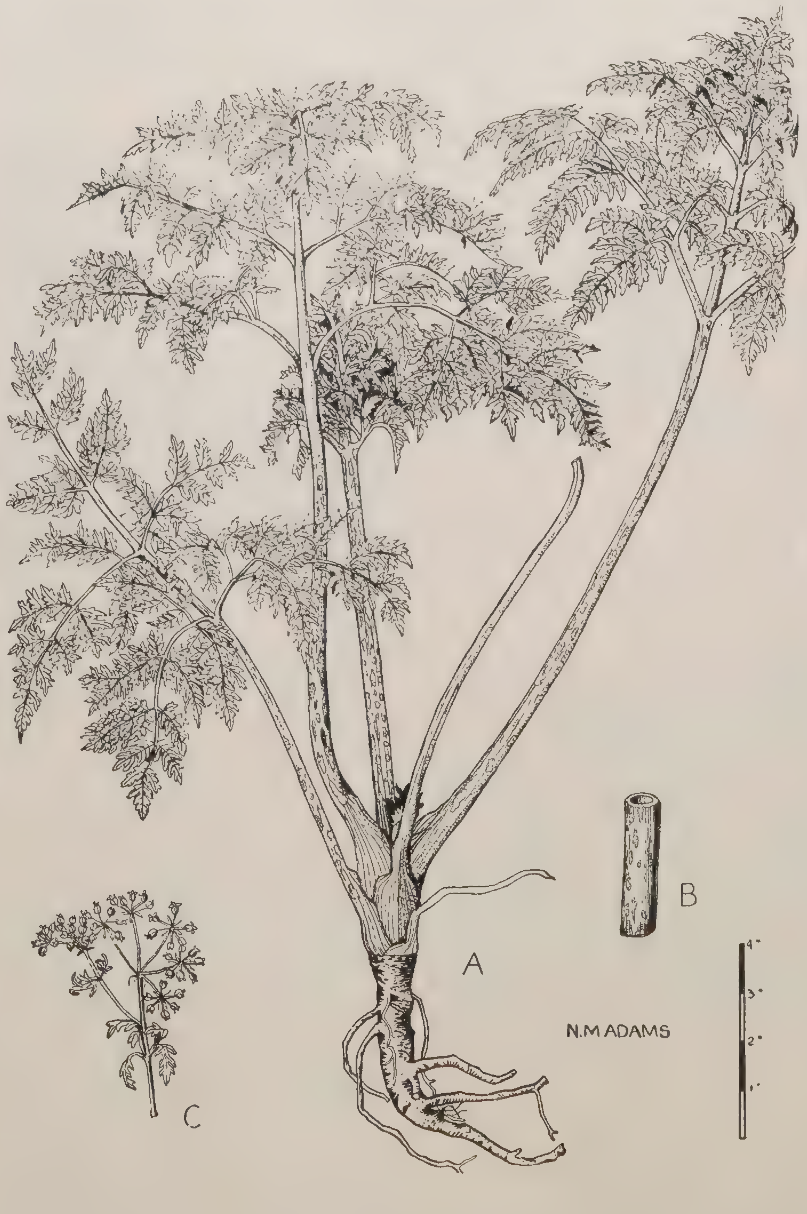

Fig. 13—Hemlock (*Conium maculatum*). A: Habit. B: Hollow petiole. C: Flowering branch.

"Animal Breeding": A. L. Hagedoorn

DR. HAGEDOORN, besides being a geneticist, is a well-known practical breeder of livestock. He realised that to make any improvement in the standard of livestock he had to by-pass the older conservative breeder and reach the individual farmer. He has accomplished a most difficult task in writing a book on breeding better animals—poultry to cows—for the practical farmer in a language and form which are clear and to the point.

Dr. Hagedoorn is direct and many of his views are revolutionary. "No useful purpose is served," he writes, "in trying to 'save the faces' of well-known authorities when the methods they advise are fundamentally and patently wrong and wasteful. It is better to have the respect of the honest breeders."

Points made by the author are illustrated in an amusing manner which greatly assists the reader to retain them in the memory. In the chapter on correlation of individual characteristics as judged at shows and the real value of these points in selecting good breeding stock, he drives the lesson home by suggesting that it would be better to select music teachers by their pupils' abilities in music and not go by the length of the teacher's hair.

A lecture tour of Australia gave rise to a new chapter on his findings there and these are very applicable to New Zealand.

Dr. Hagedoorn thinks it is a bad mistake to keep on importing new stock from Britain, as it hinders the breeds' settling down and becoming adapted to the country.

He considers that the show system can be blamed for the importation of "showy-good" stock instead of making more use of material already to hand, which is better fitted and adapted to Australia.

Dr. Hagedoorn was very amused to see blue ribbons won at shows by young mature beef bulls which were fed on Jersey nurse cows supplemented by a diet of eggs. As he points out, that sort of thing, although it profits a few, gets the general stock of the country nowhere.

Show stock have to take some hard knocks, but if taken as Hagedoorn means, the lessons learnt would save New Zealand thousands of pounds every year.

—*W.D.R.*

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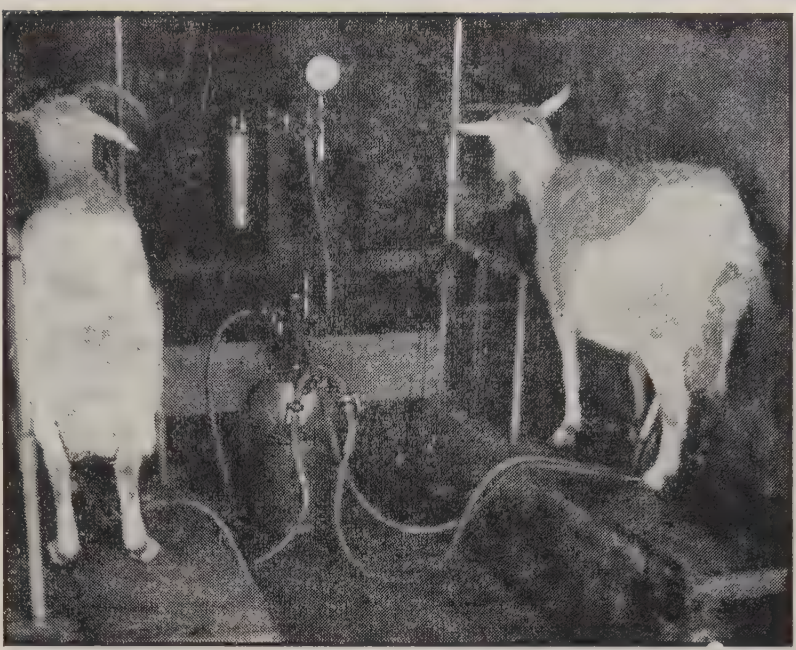
Dairyfarming Annual 1950: Massey Agricultural College, Palmerston North. 10s.

A wide field of good farming practice based on the results of research and the experiences of progressive dairy farmers is covered in Dairyfarming Annual 1950, which consists of the addresses and discussions at the 1950 meeting of dairy farmers at Massey College; authoritative articles on other farming subjects are included.

Milking Goats

THE milking of goats and the treatment of ailments from which goats may suffer are discussed in this concluding portion of an article on milking goats by A. G. Brash, Veterinarian, and C. P. Harris, Inspector of Stock and Dairies, both of the Department of Agriculture, Christchurch. The first part of the article appeared in last month's issue of the "Journal".


Saanen goats being milked by machine on a goat farm near Christchurch.

THE value of goat's milk has long been established. It is almost pure white; the cream rises very slowly and never so thoroughly as in cow's milk. Goat's milk is a comparatively rich milk intermediate in fat content between that of a Jersey cow and a Friesian cow. All milk undergoes a process of curdling in the stomach; with cow's milk the curd is large, hard, and tough, but the curd of goat's milk is small, light, and flocculent, and therefore more easily digested. Goat's milk is said to be digested in the human stomach in 20 minutes, due to the fine curd and to the fact that the small fat globules are easily assimilated.

For ordinary use goat's milk can be taken fresh and in its raw state with every confidence in its purity and high nutritive value.

Tuberculosis in goats is extremely rare and there appears to be no record of a case in New Zealand or Australia. There is no record in New Zealand of undulant fever being contracted from goat's milk.

One of the most important uses of goat's milk is for the feeding of infants and children showing an abnormal reaction or sensitivity to cow's milk. This may be the cause in some cases of skin troubles such as eczema or urticaria. Children showing an antipathy to cow's milk can often drink goat's milk with impunity, and people who are allergic to beef protein derive benefit from goat's milk.

For general use goat's milk can be utilised for the same purposes as cow's milk and has proved very satisfactory. Next in value to goat's milk is cheese. Some of the most expensive brands of imported cheese are made either wholly or partially from goat's milk. In countries where sufficient quantities are available goat's milk is evaporated, sold in dried milk form, and used when the liquid is not obtainable, thus assuring patients on a goat's milk diet of a continuous supply.

Milk Yield and Lactation Period

The milk yield and lactation period are, of course, very important, as the value of a doe is estimated largely by her milk production. Good does should produce from 8 to 15 times their weight in milk in a lactation period. Goats under test have shown such ratios, and exceptional animals have yielded as much as 18 times their weight. A production of 6 to 7 pints a day for a lactation period of 8 to 10 months is considered within the capacity of an average good milking goat; no animal yielding less than 200 gallons each year should retain its place in a commercial herd.

Milk recording—a means of ascertaining the exact yield of milk from an individual animal during a specific period—is advisable, and for the pedigree breeder and the commercial producer it is essential. For the amateur it adds enormously to the interest of the hobby. Each doe's milk should be weighed and her daily production recorded.

Applications for herd testing should be forwarded to the Herd Improvement Association.

Tests taken of composite milk samples from a local herd of milking goats averaged 4.25 per cent. butterfat and 9.15 per cent. solids not fat over 12 months.

Milking Routine

The rules for milking are: Speed, regularity, gentleness, quietness, and cleanliness. A normal healthy goat with no obstructions in the teats should not take longer than 3 to 4 minutes to milk. This includes washing and drying the udder and teats before milking. If longer is necessary, the goat has been allowed to get into bad habits and the total quantity of milk will not be so great as when the animal is properly trained. The object of the milker is to teach the goat to have a regular let down of milk by adopting a regular milking routine. This is of such importance that, with the exception of food and water, nothing will influence the milk yield more. The period between milkings should be divided as equally as possible. A very heavy producer may have to be milked three times a day, but twice is sufficient for most does.

Technique

The manner of milking is also important, as the udder, a delicate organ, has to be kept in good shape. Avoid a vigorous, up-and-down motion of the hands and forearm. The goat has a softer and more delicate skin than a cow, and generally is much easier to milk. A downward pull or stretching of the teats each time is harmful. If the teat is too small to allow the whole hand to grasp it, then the thumb and the number of fingers which will fit are used. Failure to obtain all available milk will quickly dry off the goat. "Stripping"—the downward pull of thumb and forefingers on the teats—should be limited to a few times at the end of the milking.

Milking Stands

Goats should be taught to stand quietly while being milked. Owing to the lowness of the animal and difficulty which is experienced in milking at floor level, milking stands 18in. to 2ft. high and a low stool are used, the goat being milked from the side. The head is secured by collar and short chain or in a miniature cowbail. After the first two or three milkings no difficulty is experienced in getting the milkers to jump on to the stand. A little grain fed in a box at the head of the bail encourages them on to the stand. It also supplies a regular feed, and the goat submits to milking with apparent pleasure.

Clipping of Hair

The milking goat should be kept groomed, and if the hair is long and rough on thighs, legs, and udder, clipping is recommended. Should hair get

Long hair should be trimmed from the udder.

into the milk it will be removed during straining, but the bacteria on the hair will have gained entry into the milk. Apart from long hairs on the udder around the teats being a harbour for bacteria, they are a common cause of kicking during milking operations.

Milking should be done apart from the area where goats are stabled, as this prevents the milk from absorbing odours that may be present. The udder and teats should always be washed with a clean soft cloth and tepid water and finished by wiping them dry with a clean cloth; soft towelling cut into about 1ft. squares is ideal. The washing water should be changed regularly and not allowed to become dirty. The addition of a little chlorine preparation or a quarternary ammonium compound to the water will effectively destroy bacteria associated with mastitis. As the openings in the teats may be filled with foreign matter which will be removed after a little milk has been drawn, this fore milk should be milked into a strip cup and discarded. The hands should be washed clean and dried. Milking with wet hands is undesirable and unhygienic. Clean overalls should be worn.

All utensils and cloths used must be sterile. Not more than one goat should be milked into a pail and the milk from each should be transferred to a bowl or vat and strained before being cooled. Milk should not be used for human consumption until 4 days after kidding.

Straining, Cooling, and Bottling Milk

The best method of straining the milk is to use a layer of several thicknesses of sterilised cheesecloth or cottonwool in the bottom of the ordinary metal and gauze dairy strainer. Prompt, efficient cooling of the milk is important. To check the growth of bacteria the milk should be cooled to a temperature not higher than 60 degrees F. as soon after milking as possible. One of the best systems of cooling milk rapidly is to run it slowly and evenly over a small dairy cooler. If the milk trickles over the cooler in little streams, spread it evenly over the cooling surface with a sterile bottle brush used only for this purpose. The milk should then be bottled, capped, and kept in cool storage until required. Filling bottles by the jug or dipper method is not recommended.

If goat's milk is properly produced and handled, it should have no disagreeable odour or goaty flavour. Should such be noticed, the milk should not be used for human consumption. People producing and handling goat's milk should remember that any odour is quickly absorbed by warm milk, and it can readily become contaminated. The principal sources of bad odour or flavours in milk are particles of dirt or hair that fall into it during milking, keeping the does in unclean quarters, and milking in stalls near the buck or in dairy premises that are not kept scrupulously clean. All utensils and cloths used must be kept thoroughly clean and sterile.

Housing

In planning a layout for a milking and feeding shed it is as well to keep in mind the ideal which, although it cannot perhaps be achieved at first, can be approached.

The feeding room is constructed according to the size of the herd. Kidding pens are recommended, also pens for housing the young kids until they are weaned. These compartments are usually between the feeding room and concentrates room. It is important that where a number of goats are housed they may be securely fastened up to prevent bossing about by the stronger animals. Separate sleeping and feeding stalls can be arranged by erecting partitions if desired. For cleanliness the stalls should be fitted with raised movable gratings on which fresh straw for bedding can be placed daily.

It will greatly facilitate feeding operations if the hay racks, feed boxes, and drinking containers are accessible without the stall having to be entered. Feed boxes and water can be reached by goats through portholes in their pens.

Because a large amount of hay is wasted when it is fed loose, hay racks should be provided in the feeding room. Trays at the bases of racks can be used for feeding concentrates. Battens or piping used for racks should not be more than 2in. apart, or young kids are likely to get their heads between the bars and be strangled.

All floors should be of concrete with a fall of 4in. in 10ft. to allow drainage. All housing quarters require cleaning daily and to be provided with fresh bedding. Care should be exercised in the type of bedding used to avoid the dangerous results from goats feeding on roughage which is mouldy or otherwise unfit for food.

Milking Stalls and Dairy

The main essentials for any milking shed are convenience for milking, provision for efficient cleaning, and good drainage. Concrete floors, walls, milking platforms, and yard should be easy to wash and keep clean. Pipe stalls last longer and are more easily cleaned than wooden ones. A concrete trough outside the dairy will provide ample water for washing down and can be connected to receive the discharge water from the milk cooler. Whether the yard area shall be under cover will depend on the climate.

Dairies must be amply ventilated, vermin and dust proof, and of sufficient size to house all the necessary equipment. There should be benches and racks to keep everything off the floor. The water heater if installed outside prevents any steam or heat nuisance inside the dairy.

Commercial goat keepers desiring to sell goat's milk are requested to consult local Inspectors of Stock before erecting new shed and dairy premises or altering existing buildings. Plans and complete details covering conditions with which it is necessary to comply for registration are available from the Livestock Division, Department of Agriculture, Christchurch, and may save unnecessary alteration or expense in correcting faulty buildings.

Movable Shelter Houses

Shelter houses built on sledges serve many useful purposes. Fenced runs are necessary for the kids after weaning, for rotational grazing, and to separate the bucks. They can be used to advantage as extra winter quarters and for shelter in the other seasons. The floor space is 6ft. x 6ft. The back wall is 5ft. 6in. high, the front wall 6ft. 6in., and there is an overhang of 2ft. 3in. The front is boarded up 4ft. and the remainder covered with wire netting. The house is divided into two compartments by boards. to a height of 4ft., and wire netting. The walls must be draught proof. At each end there are four feed pens, one at each side for concentrates and two in the centre for lucerne hay. There is a lid above the feed pens to enable feeding to be done from outside. A raised wooden grating is hinged on the back wall to provide for straw bedding and easy cleaning. There is a container for drinking water on the dividing wall and a box for lick in the front wall.

Common Ailments of Goats

Although by no means delicate, goats are subject to disease. However, if consideration is given to correct methods of care and management, hygiene, and feeding, many ailments can be avoided. The diseases of goats are closely allied to those of sheep and in general the treatment in cases of disease is the same for both.

Fortunately tuberculosis in goats is very rare, especially in New Zealand. Kids could, however, be infected with

Before milking, the udder and teats should be washed with a clean cloth and then thoroughly dried.

milk from an infected cow. Infection of goats with the organism of contagious abortion (*Brucella abortus*) is also practically unknown. This fact has no connection with the old and unfounded belief that running a goat with the herd helps to prevent contagious abortion in cows. However, its importance in the production of a safe milk supply is obvious. *Brucella melitensis* infection, the cause in some countries of the serious disease in human beings called Malta fever, does not occur in New Zealand.

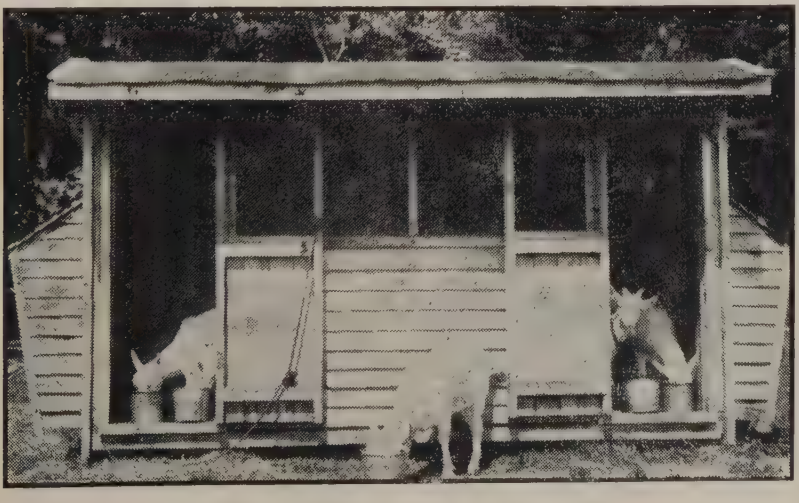
Worm Infestation

Worm infestation is the commonest trouble in goats and can be the cause of much loss where steps are not taken to control it. Goats are affected mainly by the same species of worms as are sheep and these worms are mostly interchangeable. As worm infestation is usually difficult to detect in the early stages, trouble should be anticipated by regular treatment before symptoms appear. Where worm infestation is suspected samples of the droppings can be examined by a Veterinarian to determine the degree of infestation. Kids are most susceptible. The most constant symptoms are progressive loss of condition with harsh, staring coat and loose or fluid droppings. Diarrhoea may not always be present and in some animals severe infestation may be accompanied by constipation. There is also a progressive reduction in milk supply and gradual loss of appetite. In all cases where the cause of death is in doubt a Veterinarian or Inspector of Stock should called in.

Treatment and prevention: Phenothiazine treatment is safest and best. Treat kids as soon as they reach 3 months and all does 2 weeks after kidding. In severe infestation repeat all doses after an interval of a fortnight. Treatment may be repeated throughout the year as found necessary, but the whole herd should be treated at least twice a year. Do not treat does within a month of kidding, as dead kids may be born. Full doses of phenothiazine will discolour the milk, the pink discoloration developing after the milk has been exposed to air for a few hours. Milk obtained within 48 hours after dosing should be discarded. White goats when treated with phenothiazine should be protected from direct sunlight for 48 hours after treatment. A goat that does not tolerate the treatment well may have the dose over a week or 10 days.

Use the following dose rates for phenothiazine: Adults, 1⅓oz. of powder; 12 to 18 months, 1oz.; 8 to 12 months, ¾oz.; and 3 to 8 months, ½oz.

Good feeding will help to increase resistance. Avoid overstocking of pastures and do not stock damp areas heavily unless goats are treated every 6 to 8 weeks with phenothiazine. Rotational grazing should be practised where possible. A rest of even 4 to 6 weeks will reduce infection on pastures greatly. Use may be made of the electric fence for controlling grazing and goats will appreciate changes to fresh areas.



A useful type of movable shelter house.

Diarrhoea

Diarrhoea is seen in adults as well as kids. In adults it may be due to worm infestation, ingestion of certain weeds (such as dock, sorrel, etc.), or rapid changes from one type of feed to another. Treatment consists in removing the cause.

In kids, diarrhoea may be due to worm infestation or to digestive disturbances caused by faulty feeding. Where kids are being hand reared diarrhoea may be caused by overfeeding, feeding at irregular hours, or the use of dirty bottles. Cow's milk may be fed diluted by adding 25 per cent. of water. Diarrhoea due to digestive disturbance should be treated first by giving a purgative such as ½oz. of Epsom-salt and a level teaspoon of ginger in ¼ pint of water, or ½ to 1oz. of castor oil. Give only boiled water for one feed then reintroduce the normal feeding gradually. More severe cases may require treatment with sulphamezathine (a veterinary prescription is required), which is excellent where bacterial infection or coccidiosis is the cause of the diarrhoea.

Enterotoxaemia or Pulpy Kidney

A condition similar to pulpy kidney in lambs may occur in goats of all ages, but more commonly in goats from 6 months to 2 years. Two forms of the disease are recognised. The acute form nearly always ends fatally within 36 hours; its onset in milking goats is usually marked by a sudden drop in milk yield, loss of appetite, and severe and sometimes blood-stained diarrhoea. The chronic form is characterised by bouts of diarrhoea and marked depression and usually lasts for 7 to 10 days;

affected goats often recover after a short convalescence.

The disease is often associated with sudden changes of feed, especially changes on to grass or greenfeed crops, and these should be introduced gradually. The response to vaccination is not as good as in sheep. Treatment with sulphamezathine has proved very effective.

Mastitis

Despite the highly developed state of the udder in goats, mastitis is not often a cause of serious loss. The bacteria found are similar to those causing mastitis in cows, streptococcal and staphylococcal infections being most common. In the acute forms there is heat, pain, and swelling of the affected side; chronic infections may give rise to hard fibrous tissue. Changes in the milk vary from the presence of a few flakes or clots up to greatly altered secretion. Infection may sometimes be present without apparent alteration in milk. This may be the cause of a bad reductase test and requires investigation and treatment. Preventive measures include attention to good hygiene such as washing the hands and teats both before and after milking and keeping the shed clean. Affected does should be milked last into a tin containing disinfectant.

The best treatment in most cases is the injection through the teat of penicillin cerate or aureomycin ointment from the tubes used for cows.

Retention of Afterbirth

Retention of afterbirth is not uncommon in does which have had a difficult kidding. In no circumstances should the afterbirth be pulled away, as manual removal is difficult and dangerous and is undesirable and unnecessary. Washing out with a warm antiseptic solution is often of great assistance. It should be done within 24 hours or so, before the opening into the uterus or womb has closed. If this is not successful, veterinary assistance should be sought, as treatment with drugs such as sulphamezathine or penicillin will often prevent blood poisoning.

Milk Fever

Milk fever is usually seen just after kidding, but may occur just before or even several months after. It is more common in heavy milkers at second, third, or fourth kiddings. The high milking propensity of the goat renders it particularly susceptible to milk fever. The onset of symptoms is sudden, the doe often being found down and more or less unconscious. The early symptoms of lassitude, loss of appetite, or unsteady gait may not be noticed. Breathing is slow and shallow.

Treatment is by the injection of 1oz. of calcium borogluconate in 4oz. of water. The injection should preferably be given into a vein by a veterinarian, but may be given subcutaneously, that is, under the skin. Prevention is difficult as calcium intake in the food has little or no effect on the blood calcium level. The does should not be milked out completely for the first two or three days.

Impaction and Constipation

Impaction and constipation are seen mostly in older adults which are overfed and under-exercised. Dry, hard feed, fibrous feed, and absence of greenfeed are common causes. Impaction is first noticed when chewing of the cud ceases; there is a tendency to bloat, appetite disappears, and dullness sets in.

Provide greenfeed and drench with 2oz. of Glauber's salt or Epsom-salt in a pint of water to which has been added a tablespoon of molasses.

Bloat

Usually bloat occurs when goats are running on succulent greenfeed, especially clover or lucerne. Some goats are apparently more susceptible than others.

For treatment pull the tongue as far forward as possible to induce the passing of gas or pass a narrow rubber tube down the gullet. Give a teaspoon of vegetable oil of turpentine in a ½ pint of milk.

Laminitis

Laminitis or founder may be caused by excessive feeding on grain or travelling on hard roads with badly trimmed feet. Acute lameness is always a symptom. The animals refuse to walk and usually progress on the knees. The feet are hot and tender. Hooves grow long and unless trimmed become misshapen.

For treatment give laxatives such as 2oz. of Glauber's salt or Epsom-salt in water and reduce concentrates in favour of greenfeed. Allow the goat to stand with the feet in a cold bath with ice if it is available.

Ophthalmia

Ophthalmia (pink eye) is similar to pink eye in sheep. It begins with a watery discharge from the eyes and inflammation of the lining membranes of the eyelids. In severe cases a bluish-white film develops on the eyeball.

For treatment apply a few drops twice daily of 10 per cent. argyrol or ¼ per cent. zinc sulphate solution. Penicillin eye ointment is also useful. Isolated cases of pink eye are more likely to respond to penicillin than the highly infectious type, which spreads through the herd quickly and affects many animals at one time.

Sore Teats

Chapping and cracking of teats occur usually in winter and spring. They may occur when the teats are not dried after milking and are exposed to cold conditions. Teat injuries may also be caused by thorns and barbed wire.

For cracked teats apply the following ointment after milking: Salicylic acid 2 drams, benzoic acid 1 dram, lanolin 6 drams, and petroleum jelly to make 2oz.

Goat Pox

Goat pox has a similar cause, course, and symptoms to cow pox. The first sign is the appearance of reddish circular areas about ¼in. across on the teats or udder. These later become raised as a watery blister and progress to a pus-filled pox lesion. After a few days this is replaced by a scab which finally falls off, leaving a white sunken area. Sometimes the end of the teat may be affected. Goat pox is transmissible to human beings and the typical stages are seen usually on the hands. Once a goat has had the infection it remains immune for life against further attack.

Treatment

A compound of equal parts of tincture of iodine in glycerine or 3 per cent. salicylic acid in glycerine is a useful application. The ointment given for sore teats may also be used.

Scabby Mouth

A condition similar to scabby mouth or contagious ecthyma in sheep may sometimes occur in goats. The course of the disease on the lips is similar to that described for goat pox on the teats. Kids particularly are affected, but when recovered are immune from further attack. The affected areas may be treated with a lotion of equal parts of tincture of iodine and glycerine.

Poisoning

The ability of goats to reach up to quite considerable heights and their habit of nibbling at accessible trees, shrubs, and plants render them possible subjects for plant poisoning. However, it is usually found that few goats eat poisonous greenery in sufficient quantity to harm them unless they are tethered near it. Rhododendron and yew are exceptions which may be readily eaten and cause severe illness or death. Among other plants which may cause poisoning are laurel, daphne, iris, hemlock, and spurge. It is doubtful if laburnum ever causes poisoning in goats, as they pointedly avoid eating it.

In most cases of plant poisoning the symptoms include salivation, diarrhoea, abdominal pain, dullness, and possible straining. If plant poisoning is suspected, no time should be lost in getting in touch with a veterinary surgeon.

Goats like other animals may ingest chemical poisons that have been left lying about. The poisons most likely to be encountered are arsenic and lead compounds, strychnine, and phosphorus.

Lice, Ringworm

Two types of lice may infect goats, a biting and a sucking type. Kids are most susceptible, heavy infestation in adult goats being restricted to those in weak and unthrifty condition. The skin is dry and scurfy and constant rubbing leads to a rough appearance. Complete control can be obtained easily by the use of "Gammexane" or D.D.T. dusting powders. One treatment with these powders is usually sufficient. Goat lice cannot live on sheep.

Ringworm is caused by a fungous growth on the skin or in the hair follicles. The hair falls out, leaving circular bare areas. Wash the affected areas thoroughly with warm water to which washing soda has been added at the rate of 1 tablespoon to a gallon, and when they are dry apply a 2 per cent. solution of photographic hypo (sodium hyposulphite) or tincture of iodine.

Lucerne Growing in Otago and Southland

By A. G. KERR, Assistant Fields Instructor, Department of Agriculture, Invercargill.

THIS article was prompted by a recent investigation by the writer into the progress of lucerne growing in Otago and Southland during the past 20 years, in which the total acreage of lucerne has remained more or less constant at a figure of approximately 9000 acres. Contrary to what might have been expected the development of irrigation, particularly in the Vincent County, has not resulted in an increased acreage of lucerne, but actually the reverse. In Maniototo and Waitaki Counties, where irrigation is still undeveloped, an increase has taken place corresponding to the decrease in Vincent County. Farmers in the Maniototo rely on large areas of lucerne for grazing.

OTAGO-SOUTHLAND has a wider range of soil and climatic conditions than perhaps any other area in New Zealand. The rainfall varies from approximately 40in. annually in Southland and coastal Otago to 25in. in North Otago, while in Central Otago the average is about 16in. Soil types also differ extensively. Central Otago soils are derived from mica schist rock, which is relatively high in potash, phosphate, and calcium; North Otago has outcrops of limestone and sandstone and the soils generally are fairly fertile; in South Otago and on the Taieri Plains are other areas of high fertility, and Southland soils are mainly low in lime and phosphate and give a gratifying response to top-dressing.

Lucerne or alfalfa (which means the perfect food) is a native of Arabia and was introduced to Europe in 475 B.C., when it was grown extensively for fodder purposes. It was first introduced into New Zealand about 1900 and was used for greenfeed and hay. Farmers were cautious in adopting the crop, but the area in it has grown to 43,000 acres. Of this area 9000 acres is grown in Otago and Southland, the bulk (8000 acres) in Waitaki, Maniototo, and Vincent Counties. From these figures it is readily seen that the greatest acreage is grown in the drier areas of Otago Province.

Reasons for Distribution

Two of the many reasons which make lucerne such an important crop in these dry areas are: First, its ability when once established to resist drought, as its roots have been known to penetrate to great depths and hence can draw upon a large area for moisture. Secondly, being a legume it has the ability of utilising nitrogen from the atmosphere, converting it to its own use, and releasing still more in the soil.

Soil and Climate

Many believe that lucerne is a difficult crop to grow, but experience has shown that it is not as exacting in its requirements as was thought at first. In coastal districts where the rainfall is about 40in. per annum lucerne is not grown extensively due mainly to difficulty of establishment caused by weed infestation of the stand and to the hazards of haymaking under such rainfall conditions. The soils best suited to lucerne are fertile, deep, open, well-drained loams, but the crop can be grown successfully on a wide range of soil types, varying from light sandy or shingle soils to fairly heavy clays, provided they are well drained and in good heart. The optimum soil and climate requirements for a permanent hay stand are moderate to high fertility, sufficient depth of soil for lucerne to develop its extensive root system, good drainage, as the plant is intolerant of "wet feet", and a fairly long warm harvesting period. Under these circumstances at least three cuts a year can be expected.

Preparation of Seed-bed

The most important point to be remembered in preparing the seed-bed is the problem of weeds. As young lucerne plants grow very slowly and are readily choked by weeds, every effort to destroy weeds should be made during seed-bed preparation. There are more failures of lucerne crops through sowing in weedy seed-beds than for any other reason. It is most desirable, if not essential, that some other crop should be sown first to act as a cleaner. It is most important to get a complete kill of weeds in one season, and it is the twitches, grasses, and clovers that remain which form the nucleus of a later weed invasion. However, where it is not possible to grow a cleaning crop the lea paddock should be skim ploughed in early autumn and deep ploughed in early spring. The last 3 months before sowing should be spent in grubbing, harrowing, and general top work to clean the area. Not only does this kill all the germinating weeds, but it assists in the storing up of soil moisture. Because lucerne seed is relatively small, it is essential to get the seed-bed fine and sufficiently consolidated to allow seed to be sown at a uniform depth; repeated strokes of the harrows will give this condition. The last operation before sowing is rolling, seed being sown on the rolled surface.

Liming

Like all legumes lucerne thrives best where there is an adequate supply of lime. The optimum pH for lucerne is 6.8; that for white clover is 6.2. It will be seen from this comparison that lucerne requires a sweeter soil than does white clover. It is usual to sow carbonate of lime before the final cultivation before sowing, the amount varying with the district. If the paddock has not been limed before or a long time has elapsed since its previous liming, an application of at least 1 ton per acre is desirable. When it is realised that each year lucerne

A lucerne stand in Central Otago.

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removes approximately 350lb. of lime per acre from the soil in addition to the amount leached out it is readily seen why lucerne gives such a gratifying response to lime applications.

Seed Inoculation

For lucerne to make its maximum growth certain bacteria must be present in the soil. These bacteria invade the roots and form nodules, which in turn build up a supply of nitrogen for use by the plant. By inoculating the seed the farmer is making doubly sure that the young lucerne plant secures the nitrogen it requires. To obtain the bacteria a farmer purchases a prepared culture through his mercantile firm, stating the quantity of lucerne seed to be sown. Inoculation is carried out by diluting the culture with skimmed milk and moistening the seed thoroughly with it to ensure distribution of the bacteria. Before sowing the seed it is necessary to dry it and this should be done in some warm shady position. Care should be taken to ensure that the culture is not exposed to direct sunlight, which is detrimental to the bacteria. If the weather is at all doubtful inoculation should be delayed, as it is of prime importance to sow the seed as soon as possible after this operation. The average cost for inoculation is about 1s. per acre.

Manuring

It is well known that sowing inoculated lucerne seed in direct contact with soluble fertilisers nullifies the beneficial effects of the culture. For this reason it is recommended that equal parts of reverted superphosphate and carbonate of lime be used and that the mixture should be sown at 3cwt. per acre with the seed. Reverted superphosphate is not infrequently used, but there is still the risk of securing a line which has not been wholly reverted and such fertiliser will injure the treated seed.

Sowing

The rate of sowing depends largely on the amount of weed competition expected. In wet areas, where the competition is vigorous, about 16lb. per acre should be drilled through every coulter. (It is assumed that the germination test is satisfactory, otherwise more seed should be sown.) In the drier areas, where weed competition is less serious, 10lb. per acre is sufficient, and in Central Otago rates as low as 5lb. per acre give excellent results.

Essential points when sowing seed are:—

It must be sown very shallow; it would be more accurate to say that it should be sown on the ground rather than in the ground. A good check is to examine the area behind the drill, and if a faint trickle of manure can be seen on the top of the ground, the seed is deep enough.

Seed should be covered lightly immediately after it is sown. To do this it is usual to have a light harrow attached to the drill. The light covering of soil will protect the treated seed from direct sunlight.

It was formerly thought that cross drilling gave a better ground coverage than drilling in one direction only, but it would appear from a few years' trials and from practical field experience that there is little to recommend the practice, as in most cases the second sowing buries the first seed sown, much of which fails to germinate.

Where seed is broadcast it is customary to use a heavier amount of seed per acre.

Time of Sowing

November is the usual month to sow, but where weed competition is strong, it is advisable to delay sowing until early February, when danger from competition with annual spring weeds is diminished.

Treatment for First Year

Under normal conditions the stand needs little attention during the first year. However, when weeds such as fat-hen or Californian thistle invade the stand and threaten to take command a cut with the mower is advisable to remove this growth. It is usual to have the cutter bar raised sufficiently high to miss the developing lucerne plants yet cut off the weed growth. It may be necessary to repeat the operation in a month or two, depending on the season. If this cut material is exceptionally thick, it is advisable to remove it, as it will tend to smother the lucerne plants below.

Haymaking

There are many factors which make lucerne hay so outstanding in value. Among these are its high yield per acre—in a normal season at least three crops a year can be expected, each averaging about 1½ tons of hay per acre—and its high nutritive value, it being especially rich in phosphate, lime, and protein.

It is essential when making lucerne hay that care should be taken to cut and handle the material at the correct time. The object is to have the hay going into the bale or stack with a high percentage of leaf, and green in colour, which indicates not only soundness, but richness in vitamin A.

To secure the best-quality hay the crop must be cut when the plant is still in the soft growing stage. The old belief that it was advisable to wait until the purple flowers appeared or the fresh shoots appeared from the crowns is now considered unsound. Left till this stage the hay is too mature with the result that it sheds its leaf readily and is too stalky.

Mowing and Raking

Whenever possible haymaking operations should not be begun until a period of fine weather can be expected. It is usual to mow lucerne early in the morning after the dew has gone, thus giving it the whole day to dry out. Raking should be started when the swath has wilted sufficiently, but care must be taken to ensure that it has not dried out so much that handling causes loss of the leaves. If the hay is very brittle, it is advisable

A first cut of lucerne in Central Otago baled and stacked.

LUCERNE GROWING IN OTAGO AND SOUTHLAND . . .

to let it lie until the cool of the evening or until the following morning, when it will tolerate handling better. After a day in the windrow under good conditions it should be fit for baling or stacking. As a rough guide hay may be considered fit for baling or stacking if when a coil of lucerne is twisted it fails to produce moisture.

Baling

Since the advent of the pick-up baler the practice of baling lucerne hay has become much more popular. With the old type of stationary baler all the hay had to be swept into the machine and then hand forked up to the table and both operations tended to defoliate the hay. Pick-up balers make both operations unnecessary, as they pick up direct from the windrow. The only manual work is in gathering the bales and stacking them. However, the chief merit of the pick-up baler is that it turns out an article which is easy to handle at feeding time and is convenient to market if there is a surplus.

Stacking

Lucerne hay is still stacked, particularly in wetter areas and by farmers who do not save sufficient hay to warrant the purchase of a baler. It has many advantages for these farmers: No expensive machinery is involved other than an elevator and a sweep; under normal conditions the hay comes out of the stack in a greener state than out of the bale; and in the handling of hay for stacking loss of leaves is not as great as when baling is done with an old-type stationary baler. Farmers who chaff hay for their own use or for retail purposes invariably put it into a stack first and chaff it as circumstances permit.

Management of Established Stands

The object in management of an established stand is to keep it in a productive state for as long as possible. It is not uncommon to hear of stands lasting more than 12 years, but normally they will be maintained for only half of that time, due to weed invasion. Once weeds become well established little can be done except to break up the area for other purposes. Annual topdressings of lime and reverted superphosphate help to suppress weed growth by invigorating the lucerne plants. It is not often realised that a crop of lucerne which yields 4 tons per acre removes from the land annually the equivalent of 350lb. of lime and 224lb. of muriate of potash per acre.

The usual practice is to topdress immediately after the first cut each season with 10cwt. of carbonate of lime and 1cwt. of reverted superphosphate. The reason for this is that topdressing in early spring assists not only the lucerne but the weeds; hence the advisability of first removing these weeds. Cultivation of a lucerne stand cannot be recommended. It may kill a few weeds, but it also injures the lucerne and makes conditions more suitable for a fresh crop of weeds. Grasses and white clover are the most common weeds in established stands and once they become abundant, grubbing will never remove them completely.

Grazing of Lucerne

In Central Otago and other dry areas lucerne, either alone or with cocksfoot, is now being sown by many farmers solely for grazing, and under efficient management it appears to give very satisfactory results. About 10lb. of lucerne is sown per acre. When lucerne is sown with cocksfoot sowing is generally carried out in January, using 12 to 15lb. of cocksfoot seed with the lucerne. For the first year it is treated as a hay paddock and not stocked. In the second year it is rotationally grazed. Care is taken not to over-graze it, by spelling the pasture until growth regains a height of about 6in.

Sheep are the only animals used, and although the paddocks do not remain pure lucerne or lucerne and cocksfoot for more than 3 years, they last longer than, and produce many times the amount of feed obtained from, any grass paddock. The inclusion of cocksfoot in the mixture, which now seems to be usual, is a sound practice, as it helps to maintain density in the sward and keeps out *Poa pratensis*.

In areas of low rainfall grazing of lucerne is gaining in popularity. In seasons when feed is in short supply lambs are not infrequently put on lucerne and fatten on it as readily as they do on rape. Ewes may be grazed on lucerne to flush them before being put to the ram; the last of the autumn growth of many hay stands is left solely for this purpose. Under the conditions described little damage is done to the lucerne, provided it is not grazed too bare. Grazing of lucerne by dairy herds in early spring before the grass comes away, or at any time when feed is short, now seems to be a common practice. In most cases the paddock is fed off in breaks and with this system the loss through tramping and soiling is reduced to a minimum. The only drawback to cattle grazing is the problem of bloat. However, risk of bloat can be reduced greatly by grazing cattle on a grass paddock before they have access to lucerne or by satisfying their hunger partially with some supplementary feed.

Other Uses

There are several methods of utilising lucerne other than those already mentioned. Chaff cut from seasoned lucerne hay is a fodder which finds a ready market with poultry farmers and stud breeders. In fact, some sheep farmers now chaff all their lucerne and feed it in that state instead of as hay. It is said that it has the advantage of avoiding the wastage that is found in lucerne hay and that stock do better on the chaff. Poultry farmers also use lucerne as greenfeed. A small area is set aside and each day sufficient green lucerne is cut for that day with a scythe or mower.

Irrigation of Lucerne

Lucerne is a plant which produces exceedingly well under irrigation. Water is usually applied by the contour-ditch system which, though perhaps wasteful of water, is in most cases the only system that is practicable. No accurate check is kept on the amount of water used, but in all cases the paddock is given a good soaking when growth comes away in spring and also after each cut or grazing. It is essential that the paddock should go into the winter fairly moist so that conditions are favourable for the plant in spring.

Irrigation, though trebling production, has some disadvantages. Unless the drainage is good, thus allowing excess water to get away fairly rapidly, the land will become wet and cold with the result that the lucerne will die of "wet feet". Irrigation also tends to hasten the development of such weeds as docks and various grasses. Another disadvantage is that irrigation increases the leaching of lime from the soil which, after a few seasons, makes the soil lime deficient, unless the deficiency is corrected by topdressing.

Main Points

The main points to be observed when growing lucerne are:—

A free-draining soil is required.

A firm weed-free seed-bed is desirable.

Apply approximately 1 ton of lime per acre before sowing.

Inoculate lucerne seed before sowing.

Use reverted superphosphate.

Sow between 10 and 16lb. of seed per acre.

Sow in November or, if annual weed competition is likely to be serious, in early autumn.

Do not graze lucerne during the first year.

When the stand is once established it should be assisted by annual topdressing with superphosphate and lime.

Cut lucerne in the green stage and avoid making stalky hay.

All haymaking operations should be directed toward avoiding loss of leaf.

Radio Broadcasts

THE following radio talks will be given to farmers from Station 1YA Auckland at 7.15 p.m.:—

April 4—"Aspects of Poultry Keeping", by S. G. Haddon, Poultry Instructor, Department of Agriculture, Auckland.

April 11—"Winter Pasture Management", by J. R. Adams, Assistant Fields Instructor, Department of Agriculture, Auckland.

April 18—"Young Farmers' Clubs", talk to be given by A. O. Lloyd, Dominion president, New Zealand Federation of Young Farmers' Clubs.

A radio talk to farmers will be given from Station 1YZ Rotorua at 7.15 p.m. as follows:—

April 12—"Varieties of Fruit Trees Suitable for Growing in the Bay of Plenty", by F. L. Bailey, Orchard Instructor, Department of Agriculture, Tauranga.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 1YD Auckland on Thursdays at 7.30 p.m., 1XN Whangarei on Mondays and Wednesdays at 8.10 p.m., 1XH Hamilton on Mondays at 8.45 p.m., 2YZ Napier on Tuesdays at 7.10 p.m., 2YA Wellington on Thursdays at 12.35 p.m., 3YA Christchurch on Mondays at 12.20 p.m., and 4YA Dunedin on Thursdays at 12.35 p.m.

Pig Broadcast

Under the auspices of the Northland District Pig Council a broadcast will be delivered in April as follows:—

Whangarei—IXN, on April 2, "From Birth to Bacon", by J. Wheeler, Supervisor, Northland District Pig Council.

Rock Gardens

By C. K. ELLIS, Horticulturist, Department of Agriculture, Dunedin.

FEW features in a garden can provide such a variety of interest in so little space as a well-planned and carefully planted rock garden. The smallest of sections may contain a rock garden housing a charming and representative collection of alpine plants, but few features of the garden are so neglected and so ill understood. Rock gardening has increased in popularity markedly during the past few years, mainly because of the adaptability of these gardens to the requirements of space and because more money is available for gardening as a hobby.

THE chief function of a rock garden is to provide the plants grown in it with conditions approximating those of their natural habitat. Alpines are the most typical of all rock plants and are mainly natives of high crags in the mountainous parts of the world. Therefore, the aim in a rock garden should be to provide as far as is possible the soil and atmospheric conditions of those regions.

Selection of Site

During the brief alpine summers the sun is fierce and baking, and many alpine plants have downy leaves to protect them from the withering rays. Ample moisture is provided for roots at this time of the year by melting snow, the water draining sharply through the open, gritty soil. Downy foliage is likely to rot quickly in winter should excessive moisture be present over the crowns of the plants, but a blanket of snow prevents this until summer returns.

For these reasons, drainage must be ample on the site selected, and where winters are damp provision must be made for covering downy-leaved species with panes of glass or other types of hand-lights, which is not necessary with glossy-leaved species. Soils having a high content of sand—in fact, all naturally light soils—rarely need any special attention to drainage, but in heavier soils, such as clays, a layer of rubble about 1ft. down is necessary, with a sprinkling of coarse grit over the top of the soil to ensure rapid removal of surface moisture.

Most alpines have long running roots to enable them to draw moisture and nourishment from crevices deep down among the rocks, for surface soil in mountainous districts is often scanty. The second major consideration, therefore, is to ensure that an adequate depth of soil can be obtained before the rocks are placed in position.

It is desirable that the situation having these qualities should be in as open and sunny a position as possible, reasonably removed from walls and large trees, which restrict the free circulation of fresh air essential to the welfare of alpine plants.

The slope of the site also is important in that it directly affects the types of plant which may be cultivated. A south slope should be used for plants easily scorched by the sun, and a north slope for those requiring maximum warmth. Some sites, such as those on an east slope, may receive full sun in the mornings, with the rays falling less directly during the afternoons; the reverse is the case on a west slope. For example, plants disliking a sudden thaw under the direct rays of the sun on a clear winter morning should be planted on a west slope.

The prevailing wind and the direction from which most of the rain comes are other factors to be considered. For instance, in a district where most showers come from a westerly quarter, a west slope receives more direct rain than does an east one, and this factor influences the suitability of a species for a position; that is, whether a plant should be grown in a wettish place at the bottom of such a west slope or in a dryish place near the top of an east slope.

Soil Conditions

The great majority of rock plants, especially the alpines, prefer a rich soil, light and porous in winter but cool and moist in summer. An excellent soil is a coarse, gritty one, rich in decayed vegetable matter, but as a whole alpines are not particular about soil and most of them thrive in a

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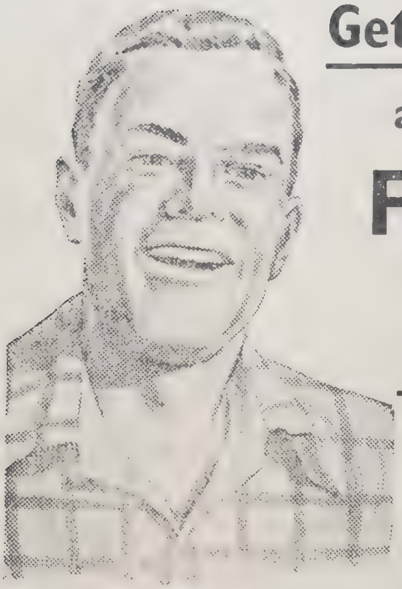
Heading photograph by Jack Welsh and Sons.



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medium which approaches that described. However, some require special soil conditions, but an area between rocks can readily be scooped out and the required compost substituted.

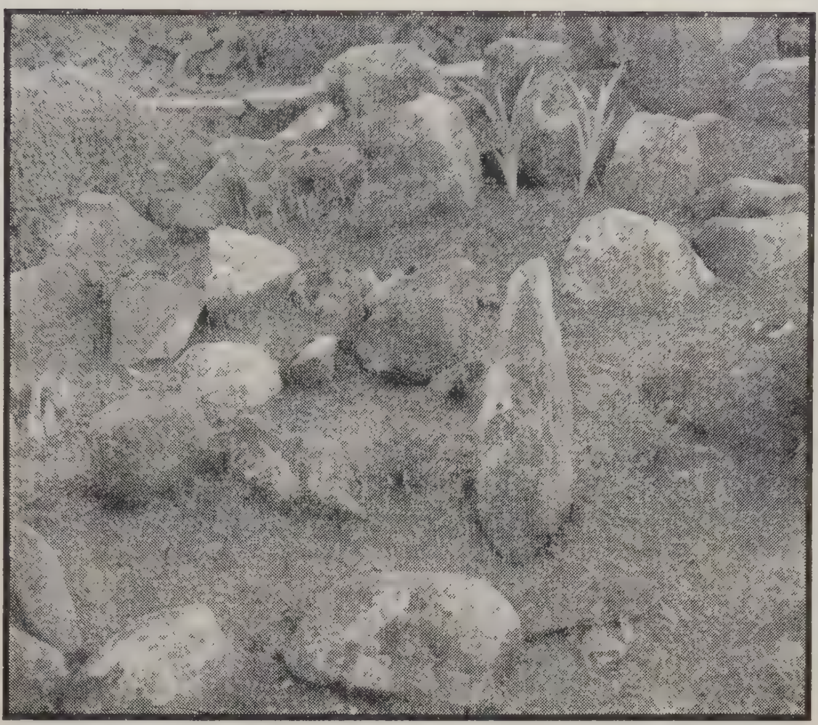
In their natural environment rock plants have the soil about their roots completely covered by stalks and leaves, and each plant touches its neighbour or the surrounding rocks, thus preventing exposure of the surface to sun and wind and retaining moisture. Until the plants in a rock garden have grown large enough, it is advisable to cover the soil about the roots with coarse sand or grit in sufficient quantity to prevent the soil from drying out.

A neutral soil condition should be the aim, for this, with slight additions, can be varied to alkalinity or to acidity.

Types of Rocks

Wherever possible the natural rock of the district should be used. Limestones, mudstones, and sandstones present a rugged, weather-worn appearance and their cracks and crevices provide a cool root-run for the plants. Porous stones are excellent, for they absorb and retain moisture, but in many areas of New Zealand hard volcanic rocks predominate and porous stones are not always available. However, most of New Zealand's rocks will suffice, and only the hardest, most impermeable ones, such as the granites, should be avoided.

The basaltic rocks found on many of New Zealand's hills are ideal, for they have an outer crust of weathered material into which some of the flat, creeping plants will root and they are often encrusted with mosses and lichens, which lend a pleasing natural appearance in the garden.



[*Jack Welsh and Sons photo.*

A recently built and partly planted garden showing the correct type of rock to use. The rocks are not closely spaced to form small pockets, but have been placed in more "natural" positions with soil between them.

[*Jack Welsh and Sons photo.*

Quarried rocks detract from the appearance of an otherwise well-built and well-planted garden.

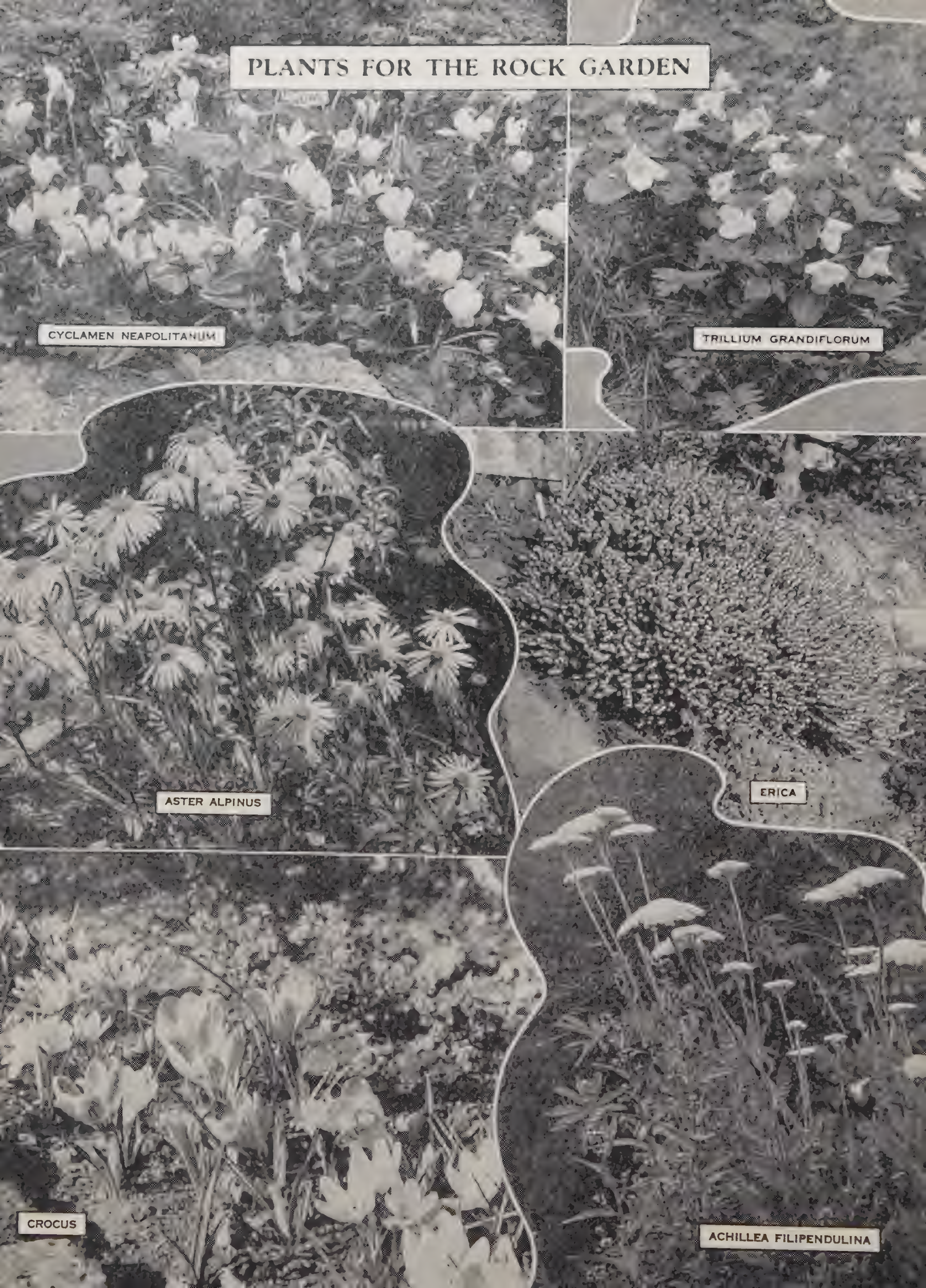
Any natural formation should be retained as a basis and the rest of the construction work done around and among it. Big rocks are essential here and there, and the whole surface should be set fairly thickly with rocks of varying sizes, and preferably of the same geological type. To obtain the most pleasing effect, the rocks should, within reason, be as large as the facilities for moving them and the size of the garden will allow.

Construction Work

Where sedimentary rocks (limestones and sandstones) are available, problems of construction are small, because the flat or rectangular slabs make it comparatively simple to build what appear to be natural outcrops. This type of rock should first be built into layers of varying thicknesses, individual rocks of each layer being of approximately the same length and breadth. For the most natural effect, all the layers should be tilted back at the same angle and the "grain" of the rocks should be parallel throughout.

In general, it is better to use a limited number of bold features than a large number of small ones. If the area being built on is small, single rocks of varying sizes may be substituted for layers, but the same simple rules must be adhered to. Perhaps the simplest way of building is to decide on the position of a large, clearly defined outcrop, use it as a foundation, and build round it.

PLANTS FOR THE ROCK GARDEN


CYCLAMEN NEAPOLITANUM
TRILLIUM GRANDIFLORUM
ASTER ALPINUS
ERICA
CROCUS
ACHILLEA FILIPENDULINA

If rounded volcanic rocks are the only ones available, the gardener's difficulties are somewhat magnified and he is obliged to be guided more by his own artistic nature than by set rules. However, the careful selection and placing of a few large rocks with prominent faces of the greatest possible height does much to simplify the problem. The placing of the smaller rocks is a matter of taste.

The pocket system of placing rocks is not the most desirable except on steep slopes where it is necessary that rocks be close enough together to prevent the soil being washed down. Where the slope will allow, it is better to leave spaces between the rocks in which small covering plants may be grown, thus decreasing the number of shelters for pests and adding to the natural effect.

In all cases and whatever the type of rocks used, it is essential that each one be firmly set, that all the crevices be tightly packed with good soil, and that none of the rocks closely overhangs the soil surface to form harbours for slugs and snails.

Choice of Plants

Though the final selection of plants may well be left to the owner to make according to his likes and dislikes, a few points should be borne in mind. To have bloom for the longest possible period of the year is the primary aim, and for this small-growing bulbs which flower in late winter and early spring are invaluable. After this the true alpines will furnish colour through summer and autumn.

Dwarf shrubs or perhaps a herbaceous perennial may be included, but size is the limiting factor and such plants usually are suitable only for the larger rock gardens. Stronger growers tend to overrun the garden and smother less luxuriant and perhaps more beautiful species, so they must be limited in number and, when established, be cut back regularly and kept in check.

As wide a variety of species as possible should be selected, but overcrowding must be avoided.

Planting Methods

In small gardens planting only single specimens of a species or variety is probably

PLANTS SUITABLE FOR ROCK GARDENS

Much confusion has been caused in the past by the use of popular names, which vary from place to place, so in the following lists only botanical names are given.

Plants for Sunny Places

Achillea species
Aethionema species
*_Allium_ species
Androsace species
Antennaria dioica
Arabis albida
Arenaria species
Armeria maritima
Armeria alpina
Aster species and varieties
Aubrietia deltoidea and varieties
†_Berberis darwini nana_
*_Bulbocodium vernum_
Campanula species
Celmisia species
†_Ceratostigma plumbaginoides_
†_Ceratostigma willmottianum_
Cistus species
*_Colchicum_ species
†_Corokia cotoneaster_
*_Crocus_ species
Cytisus procumbens
†_Cytisus purpureus_
Dianthus species and varieties
Dicentra species
*_Galanthus byzantinus_
*_Galanthus elwesi_
Genista species
Gentiana acaulis
Gentiana corymbifera
Gentiana pneumonanthe
Gentiana saxosa
Gentiana sino-ornata and other species
Geum species
Gypsophila species
Hebe species
Helianthemum vulgare varieties
Helichrysum species
Hyacinthus azureus
Hypericum species
Iris inominata
*_Iris reticulata_
Iris unguicularis (_stylosa_) and other species
Lithospermum species
Mazus radicans
†_Magnolia stellata_
Mesembryanthemum species
Morisia monanthos (_hypogaea_)
Muscari azureum
Narcissus species
Nepeta species
Nierembergia species
Papaver alpinum
Phyteuma species
†Rhododendrons of the _R. calostratum_ series
Rosa dwarf species
Rosmarinus officinalis
Saponaria species
Saxifraga species and varieties
Scilla sibirica
Sedum species
Sempervivum arachnoideum and other species
Silene species
Statice species
Sternbergia lutea
Teucrium species
Thymus species
Tulipa species
Veronica species
Wahlenbergia saxicola
Zauschneria microphylla

Plants for Shady Places

*_Anemone_ species
Aquilegia species
Auricula species
*_Chionodoxa luciliae_
Cotula species
Cotyledon species
*_Crocus_ species
*_Cyclamen neapolitanum_
Cypripedium species
Daphne blagayana
Daphne cneorum
†_Deutzia gracilis_
Epimedium alpinum
†_Erica_ species
*_Eranthis hyemalis_
*_Fritillaria_ species
†_Gaultheria hispida_
*_Hemerocallis_ species
*_Leucojum autumnale_
*_Meconopsis baileyi_ (_betonicifolia_)
Mimulus species
†_Mitraria coccinea_
Nertera depressa
*_Ornithogalum umbellatum_
Ourisia species
*_Oxalis lobata_
Primula littoniana and other species
Ranunculus species
Thalictrum alpinum
Trillium grandiflorum
Viola species

Acid-Intolerant Species

Achillea species
Aethionema species
Alyssum montanum
Alyssum saxatile
*_Anemone alpina_
*_Anemone pulsatilla_
Aqulegia species
Cistus species
*_Cyclamen_ species
Gentiana species
Gypsophila species
Lithospermum gastoni
Papaver alpinum
Papaver nudicaule
Phlox subulata
Primula (most alpine species)
Sedum species
Sempervivum species
Sternbergia lutea
*_Tulipa_ species
Wahlenbergia saxicola

Lime-Intolerant Species

†_Andromeda_ species
*_Anemone sulphurea_
*_Anemone nemerosa_
†_Azalea_ species and varieties
Daboecia cantabrica
Daphne alpina
Daphne cneorum
*_Erica_ species (except _E. carnea_)
†_Gaultheria hispida_
†_Kalmia latifolia_
Lithospermum prostratum
*_Meconopsis baileyi_ (_betonicifolia_)
†_Pernettya mucronata_
†_Pieris_ species
Primula (some species)
Rhododendron (most species and varieties)

Creeping or Trailing Species

Achillea species
Alyssum montanum
Alyssum saxatile
Androsace species
Antennaria dioica
Antirrhinum asarina
Antirrhinum glutinosum
Arabis albida and other species
Aubrietia deltoidea varieties
Borago laxiflora
Calandrinia umbellata
Campanula species
Cotoneaster adpressa
Cotoneaster congesta
Cotoneaster horizontalis
Cytisus kewensis
Gaultheria nummularioides
Gaultheria procumbens
Linaria cymbalaria
Lithospermum prostratum
Mimulus radicans
Nertera species
Polygonum affine
Rosa alpina
Rosa pyrenaica
Sedum species
Thymus species

Dwarf Trees and Shrubs

Abelia chinensis
Abies pectinata nana
Andromeda species
Azalea species and varieties
Betula alpestris nana
Cassinia fulvida
Cupressus fletcheri
Cupressus lawsoniana minima glauca
Cupressus obtusa nana
Corokia cotoneaster
Daboecia species
Daphne alpina
Erica species
Juniperus communis alpina, compressa, and _nana_
Kalmia latifolia
Magnolia stellata
Picea glauca conica
Picea orientalis nana
Pernettya mucronata
Rhododendron species and varieties
Spiraea bullata
Thuya occidentalis ericoides
Thuya orientalis compacta
Zenobia pulverulenta

Bulbs and Other Species with Underground or Ground-level Perennating Organs

Allium species
Anemone species
Bulbocodium species
Chionodoxa luciliae and other species
Colchicum autumnale
Crocus species
Cyclamen coum
Cyclamen europaeum
Cyclamen neapolitanum
Fritillaria species
Galanthus species
Hyacinthus azureus
Iris species
Leucojum vernum
Muscari azureus
Narcissus bulbocodium
Narcissus cyclamineus
Narcissus minimus
Narcissus triandrus
Scilla praecox
Scilla sibirica
Scilla verna
Tulipa clusiana
Tulipa fosteriana
Tulipa montana
Tulipa sylvestris and other species

* Bulbous plant or one with a ground-level or underground perennating organ.

† Dwarf tree or shrub

Erica photograph on opposite page by Jack Welsh and Sons; all others by Douglas Elliott.

wise, but in larger gardens it is advisable to plant three or more in a group to provide a broad mass of colour rather than a tiny patch.

Planting should be done in spring or in autumn, the latter being the better, but not later than early April, for the roots make little growth after then. If plants are to be set out in late summer or autumn, the work should be delayed until after they have bloomed, for then new growth is made. The roots of alpines should be spread out carefully so that they are not cramped and the soil rammed down firmly about them. Thorough watering must always follow planting.

Plants from pots may be planted at any time if the soil is neither too wet nor too dry. The crocks should be removed from the bottom of the ball of soil and, if necessary, the roots spread gently to relieve congestion.

A crevice in which plants are to grow should be well filled with good gritty soil, rammed firm, and the plants set in a small hole scooped from the surface. If necessary, a specimen may be held in place with a small stone until it becomes established.

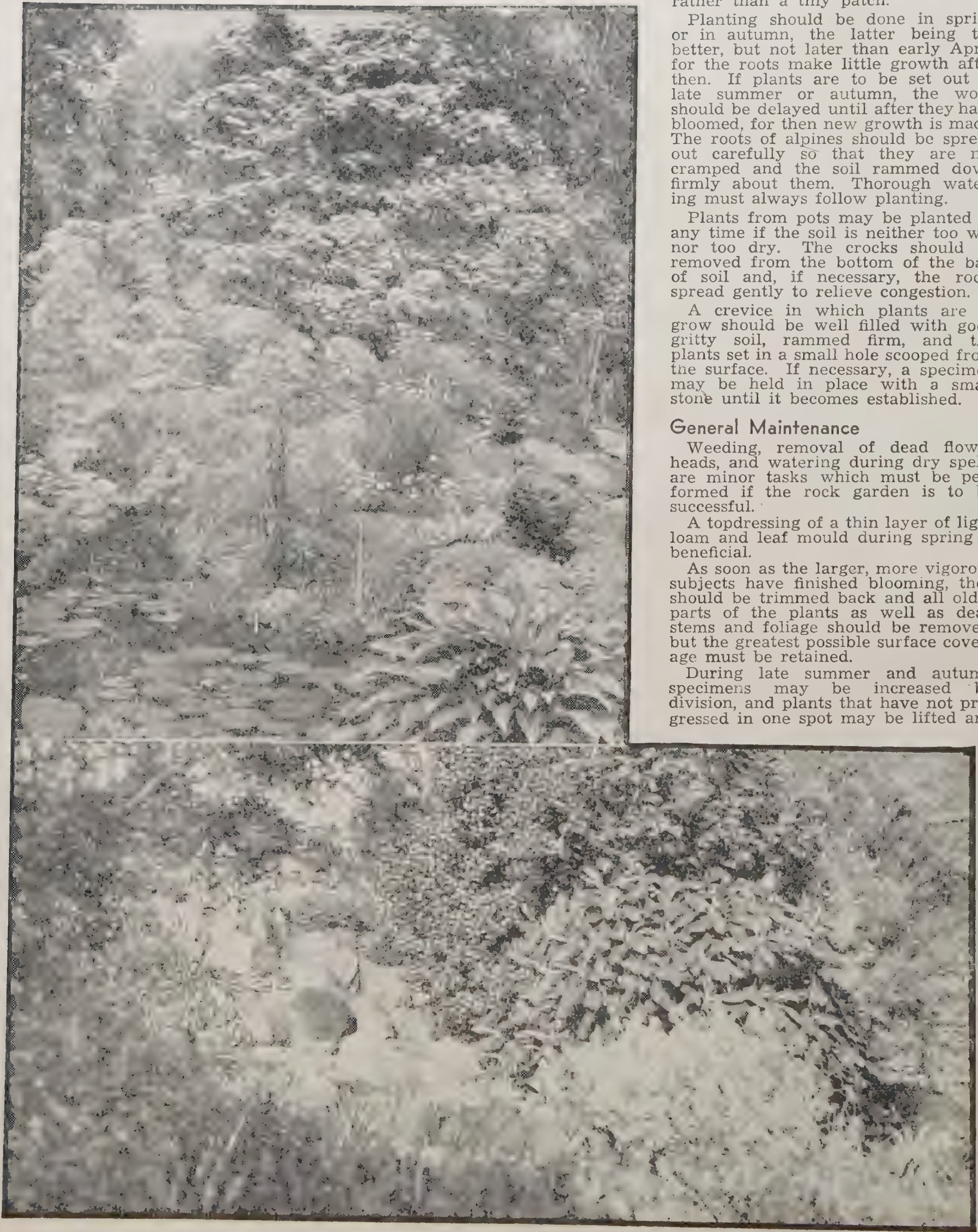
General Maintenance

Weeding, removal of dead flower heads, and watering during dry spells are minor tasks which must be performed if the rock garden is to be successful.

A topdressing of a thin layer of light loam and leaf mould during spring is beneficial.

As soon as the larger, more vigorous subjects have finished blooming, they should be trimmed back and all older parts of the plants as well as dead stems and foliage should be removed, but the greatest possible surface coverage must be retained.

During late summer and autumn specimens may be increased by division, and plants that have not progressed in one spot may be lifted and



[Upper photograph by Douglas Elliott; lower by Jack Welsh and Sons.

Shrubs and small trees are invaluable to give depth to a rock garden.

given another chance elsewhere, perhaps in a different soil. Occasionally, because of loss of vigour by starvation, it may be necessary to lift a plant, remove the exhausted soil, replace it with fresh soil of a suitable composition, and replant the specimen.

Soaking the soil thoroughly once a week is better than frequent light waterings, which wet only the upper layers of soil and tend to draw the roots up into this region. If this occurs, the plants suffer greatly with the next onset of dry weather.

Pests and Diseases

Ants, though they do not destroy foliage, tend to injure the root systems by the building of their nests. The method of control recommended is to dissolve 1lb. of sugar in 1 pint of hot water, and add 1oz. of sodium arsenate; soak a piece of cottonwool in this poisonous mixture, drop it into a tin with a perforated lid, and place it near the nest. Ant poisons should be handled with care, and containers should be labelled carefully and placed beyond the reach of children. After using all such poisonous materials the hands must be scrupulously washed.

Aphides may be eliminated readily by the use of a mild nicotine insecticide. It should be sprayed gently over the plants at 10-day intervals until all traces of the pest have gone.

[Jack Welsh and Sons photo.

Silver-foliaged plants such as the *Celmisia* lend variety among plants of the more usual green.

Earwigs, cutworms, and woodlice: The following preparation is recommended: Sprinkle 1oz. of paris green over 2lb. of dry coarse bran; in this state the mixture may be stored. When it is required for use, mix the bran with warm water to which a little treacle has been added until it is damp but sufficiently crumbly to spread over the soil. This mix will cover about 400 sq. yds.

[Jack Welsh and Sons photo.

On steep slopes the rocks should be placed close enough together to prevent the soil being washed down.

Red spider can be controlled by spraying with lime sulphur.

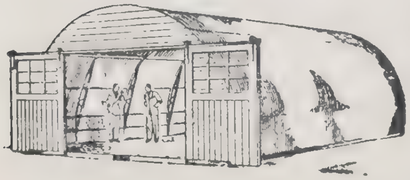
Slugs and snails are the worst pests affecting subjects in the rock garden, but the following method of control is usually effective: Mix 2 handfuls of coarse bran or oatmeal with a crushed half tablet of metaldehyde and place it in small heaps about the garden, kept dry by pieces of grass lying over the top of them. These baits attract and paralyse the slugs. The bodies should be removed each day and new traps set. Several proprietary compounds for the control of such pests are available.

Fungous diseases: Bordeaux mixture or one of the proprietary colloidal sulphur sprays is satisfactory for controlling rusts and other fungous diseases.

Propagation of Plants

Rock plants may be increased by seed (sown as soon as possible after after it has ripened), by cuttings, or by division of the roots in spring or autumn. As a rule, the home gardener is better advised to raise his plants from cuttings or by division of roots than from seed, which is a long and sometimes difficult process.

PREFABRICATED



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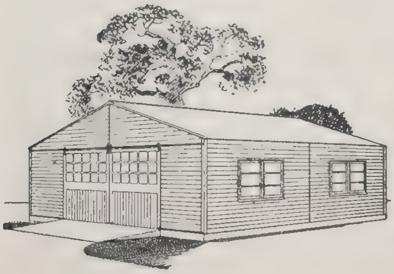

Sizes: 8ft. x 8ft., 8ft. x 16ft., 8ft. x 24ft., etc. 10ft. x 10ft., 10ft. x 20ft., 10ft. x 30ft., etc. 20ft. x 20ft., 20ft. x 30ft., 20ft. x 40ft. etc.

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[*Jack Welsh and Sons photo.*

A well-maintained rock garden is attractive and fascinating even in midwinter.

Cuttings should be taken from sturdy shoots which have ripened or are beginning to ripen, as callus and root formation occur more readily with this type of wood. Such cuttings should be taken while sap movement is steady, and most of the lower leaves should be removed, or at least reduced, to minimise water loss by transpiration. The base of a cutting should be a clean, straight cut, made with a very sharp knife, immediately below a joint, or node, from which the leaves spring. The length of this cutting is decided by the distance between the nodes; for instance, if the nodes are 1in. apart, the cuttings should be 3 to 4in. long. Half this length should be buried in the soil.

Cuttings of soft-wooded plants require a little protection. Some type of glass covering should be provided to preserve humidity and some sort of shade to give protection from direct sunlight.

Shrub cuttings may be taken in autumn when the wood is quite mature, in late midsummer when the wood is half matured, or in early summer when the shoots are "soft" or only beginning to ripen. Cuttings of most of the hardier shrubs taken in autumn may be struck in sandy soil in the open, but half-matured and soft cuttings should be given the protection of glass, as should cuttings of the hardy evergreen conifers.

Any convenient, well-drained receptacle, such as a pot or a pan, or even a box, may be used to house the cuttings. They should not be set too deeply; two-thirds of the length of a hard-wood cutting should be inserted in the compost and about half the length of a soft one. The base of the cutting should always sit firmly on the soil at the bottom of the hole made for it, or a pocket of air will be left which will merely deprive the cutting of valuable moisture. The compost should be pressed down firmly around the cuttings and no leaves should be allowed to touch the surface; if they do, they will rot.

Roots of spring-flowering plants are best divided in late summer or autumn; spring is the best time for those that flower in late summer or autumn. The clump should be lifted with as much root as possible and the crowns divided with a sharp knife, which will do the minimum of injury to the roots. The older crowns should be discarded, the stronger new ones being retained and replanted as soon as time permits.

Composts

A good compost for striking cuttings consists of 1 part by bulk of leaf mould or peat, 1 part of loam, and 3 parts of sharp river sand. All constituents should be sieved through a 1/5 or ⅛in. mesh.

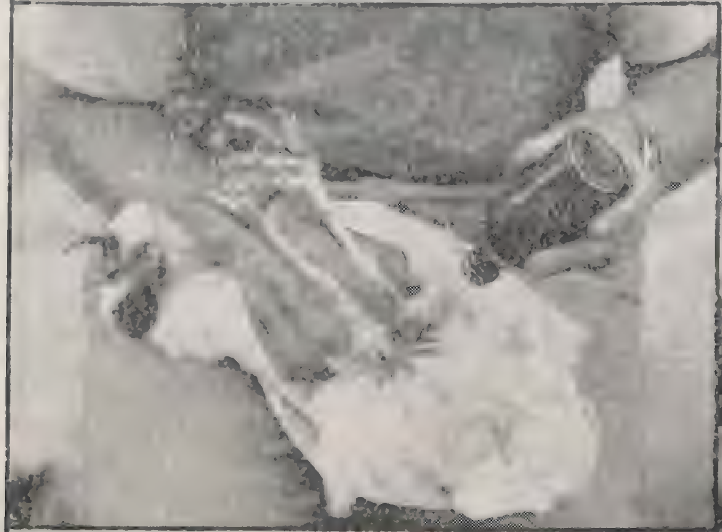
A standard compost for rock garden work may be mixed in the proportions of 6 parts by bulk of loam, 3 parts of peat or leaf mould, and 5 parts of coarse sand. For alkaline-soil plants this compost may be altered by the addition of lime and for acid lovers by the addition of aluminium sulphate or acid organic material.

[*Jack Welsh and Sons photo.*

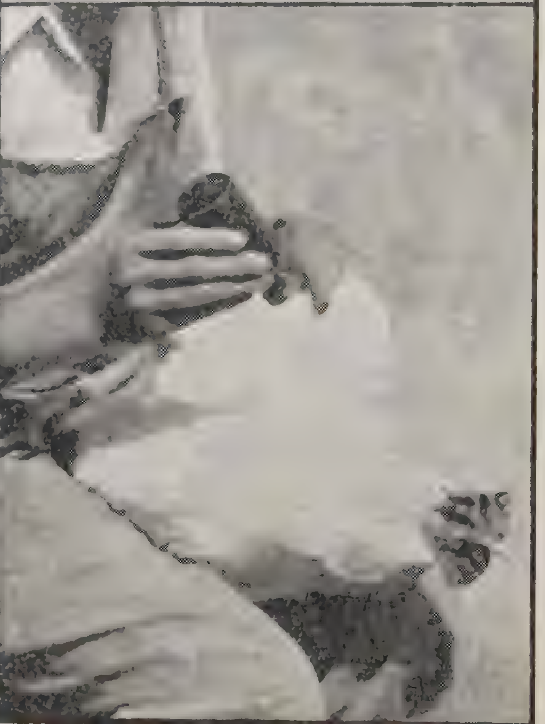
A neglected rock garden soon becomes overrun by strongly growing species and weeds.

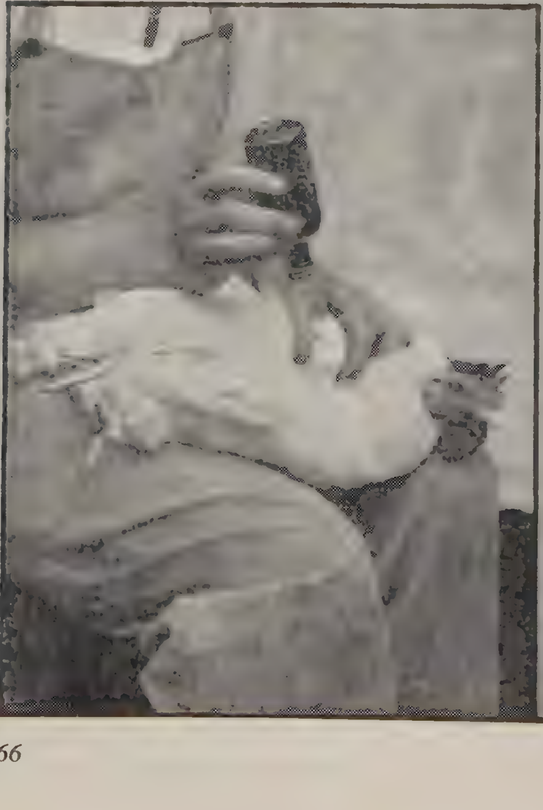
TREATING FOWLS FOR LICE

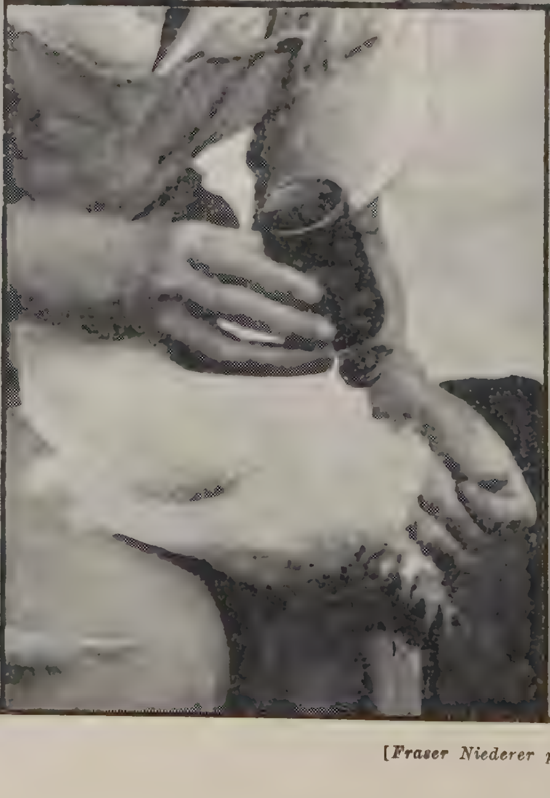
The most effective way of combating body, wing, and head lice on fowls is to treat the birds individually, placing pure nicotine sulphate of 40 per cent. strength directly on the skin so that the feathers retard the evaporation of the chemical.



Put 3 or 4 drops on the abdomen (above), but avoid letting any fall on the vent opening. Place a drop on the underside of each wing (right), then a drop on each side of the breast (lower left), and finally a drop between the neck feathers below the head (lower right). This treatment does not kill lice eggs, so they must be allowed to hatch out and the treatment repeated twice at 10-day intervals.



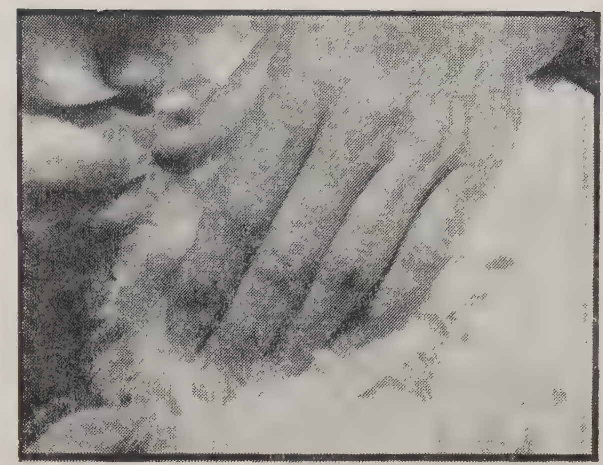




[*Fraser Niederer photos.*

Lice in Household Poultry

FEW household poultry keepers are not aware that fowls are likely to be infested by body lice, but the one who takes measures against lice is a rarity. If control methods were difficult, this inaction could perhaps be understood, but they are not. In this month's article for the household poultry keeper W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton, advises on two of the easiest methods to control lice. There are many other ways of reducing infestation, but the simplest treatments are recommended in the hope of encouraging more householders to put the knowledge to use.



BODY lice are not the only type of louse which infests poultry, but they are the most common. They do not suck blood but are biters, living on skin fragments and debris. Every amateur poultry keeper should make himself familiar with the appearance of body lice and learn how to find them quickly.

They are about the size of a large pin head when fully grown, light straw coloured, and very active. They like warmth and can live only a few days away from the host. So eager are they for warmth that they cling tightly to the fowl, never leaving it voluntarily. As they prefer the warmest portion of the fowl, ascertaining whether they are present in the flock is simple. If none is found on the abdomen among the fluffy feathers below the vent, almost certainly there will be none on other parts of the body. They should be sought by parting the loose, fluffy feathers with the fingers and at the same time searching diligently for them on the skin surface disclosed, because they quickly scuttle to cover. Only when the bird is badly infested will they be found on back, neck, and breast.

[Fraser Niederer photos.

Most household poultry keepers know that fowls should be examined frequently for body lice round the vent, as in the upper illustration, but wing lice and head lice are less well known. Wing lice live between the barbs of the main wing feathers.

If they have been on the host long enough to mature and breed, clusters of their eggs are an obvious sign. These will be seen even before the lice, but in such a case the lice will be found readily because the presence of the nits shows a heavy infestation. The favourite place for depositing the nits is at the bases of the feather stems, and especially those of the fluffy feathers immediately below the vent. The nits are grey-white, pear shaped, laid close together, and firmly attached to the feather shaft.

Other types of lice are wing and head lice, each named after the portion of the body it prefers to inhabit. Wing or shaft lice may be found between the barbs of the large wing feathers, technically called flights and secondaries. Head lice may be found either on the skin or on the feathers of the neck just behind the head. Both wing and head lice are very different in appearance from the body louse, being much longer, narrower, and dark. The easy way to find out whether wing lice are present is to fan out the wing and hold it against a light or sunshine, making the lice readily visible between the feather barbs. At first sight they may appear to be specks of dust or dirt, an impression which would seem to be confirmed by lack of movement, for even when disturbed they are loath to move. On not more than one bird in a hundred infested with body lice will head and wing lice also be present.

In a well-managed flock lice present very little difficulty. Healthy, vigorous, heavily laying fowls seldom have more than two or three lice unless infestation becomes bad among poorer flock mates. Weak, sickly birds so frequently are seriously infested that the lice are sometimes blamed for their weakness. Though the irritation caused by the lice results in loss of condition and helps depreciate egg yield, it is the lack of stamina and vigour in the fowl that permits the increase in infestation. Correspondingly, the absence of lice on active birds is often attributed to fowls freeing themselves from the pest by dust bathing. Lice so dislike leaving the source of heat and are so difficult to dislodge that a more likely explanation for their being more prevalent on weak fowls is that active birds clean themselves better and so have insufficient skin debris to feed many lice.

Heavy breeds of hens are more likely to be infested than light breeds because they are better and more loosely feathered about the abdomen. Males are far more likely than females to be lousy because they are less active in cleaning themselves.

Methods of Treatment

The two easiest methods of controlling infestation depend on fumes from nicotine sulphate (40 per cent. strength) killing the lice.

If infestation is not heavy, and particularly if no nits are present, the nicotine sulphate can be simply poured on the perches. The first step is to clean the perches thoroughly of organic matter. Then with a cloth smear a layer of luke-warm, soapy water along the perch tops; the water prevents the nicotine sulphate from sinking into the timber and the soap suds stop the nicotine from dissolving too rapidly. Some manufacturers of nicotine sulphate supply with the bottle a spare lid with a small hole in it, and they call this the applicator cap. The hole permits one drop at a time to come out when the bottle is shaken, unless it is done too vigorously when more than one drop may come out. Shake drops of nicotine sulphate on the perches at intervals of about 1½in., using 1 fl. oz. to 20ft. This treatment should be carried out a few minutes before perching time, or even after some of the fowls have begun perching for the night, and be repeated 10 days later. This method can be used as a preventive to stop heavy infestation by applying it every 3 months.

If infestation is heavy, a more effective remedy is to apply the nicotine sulphate directly to the skin of each fowl. The perch method does not kill head or wing lice. Only 9 drops are required for each bird, but none must be allowed to fall into the opening of the vent. The feathers are parted so that the drops fall on to the skin of the abdomen, wings, breast, and back of the neck. The method is illustrated on the opposite page. The treatment must be repeated twice at intervals of 10 days. Sometimes nit clusters still show even after three treatments, but these are either infertile eggs or material for fastening the nits to the feathers.

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Preservation of Original Colour and Flavour in Honey

Seasonal Notes for the Domestic Beekeeper

MANY beekeepers prefer to eat honey in liquid form as a spread and in other ways. Consequently it is necessary for them to liquefy granulated honey on hand as required after the close of the honey season, when freshly extracted liquid honey is no longer available. Important points in handling honey so that the natural colour is retained and flavour is not spoilt are discussed in this article contributed by the Horticulture Division.

THE first factor which influences the colour of honey is the plant pigment and other constituents in the original nectar from which the honey is produced. Thus the colour of honeys produced from different plants varies. Dark honeys produced from pasture sources in New Zealand are usually stronger in flavour than lighter-coloured honeys and the characters of colour and flavour are usually closely related.

The second factor influencing the colour of honey produced by many domestic beekeepers is the temperature and the amount of heating applied to the honey during extracting and preparation for packing into storage containers or when honey is reliquefied for any special purpose. Care should be taken not to impair the natural flavour and aroma of honey harvested for home consumption.

Heating Honey

Freshly extracted liquid honey will be warmed sufficiently to clarify it if heated to 75 to 80 degrees F. on its way to the settling tank, but a temperature of up to 120 degrees F. may be applied to liquefy granulated honey without detriment to flavour and colour, provided the honey is cooled quickly immediately it becomes thoroughly liquid.

Temperatures higher than 120 degrees F. and long periods of heating are likely to discolour or darken the honey, with resultant loss of natural brightness and delicate flavour. Heat should not be applied directly to the outside of the receptacle containing the honey; the container should be placed on a piece of wood in a vessel containing hot water and heated to the desired temperature in that way.

It is also important to agitate the honey slowly occasionally during heating operations to ensure a uniform distribution of heat to all portions of the honey. Large-scale beekeepers usually have a special water-jacketed heater or other equipment for this work, including the warming of honey for clarifying purposes, and particulars of such heaters may be obtained from local Apiary Instructors of the Department of Agriculture.

Flavour and Condition

Honey apparently in good condition at the time of packing sometimes tends to sour and ferment after a few months in storage, especially in warm weather. Experience has shown that such honey has been contaminated in some way during extracting and packing or has been handled and stored by the beekeeper under unfavourable conditions. Honey will ferment more readily if it remains in a soft granulated state. This condition can be recognised by the thin, light body of the honey and can be brought about by added moisture, by excessive air bubbles, or by taking combs of uncapped honey from the hives for extracting during a heavy honey flow.

Added moisture may be present for several reasons, including long storage of combs of honey during wet weather before extraction of the honey or the exposing of extracted honey in the holding tank to a damp atmosphere.

Fermentation

Honey in a soft granulated state may remain in fairly good condition during winter, but fermentation affecting flavour and general condition may occur with the coming of warm weather early the following spring. Yeast bodies which cause fermentation are present in a viable condition in unheated, freshly packed honey, but as long as well-ripened honey is in liquid form the growth and multiplication of the yeasts, even though the honey may be at a favourable temperature (above 55 degrees F.), are inhibited by the heavy concentration of sugars. However, when the honey granulates there is a partial separation of sugars and water, which reduces the sugar concentration in certain portions of the honey, where the yeasts may then grow if the temperature is above 55 degrees F.

Where stored honey is beginning to soften with the advent of warm weather following the winter storage period it should be used as soon as possible before fermentation starts. If there is more of this class of honey on hand than is required for early consumption, the honey should be placed in a hot-water bath in its original container (glass or metal) as previously described, and the temperature of the honey should be raised to 160 degrees F. for 30 minutes, when all yeasts present will be destroyed. The honey may then be used in liquid form or regranulated by methods described in the domestic beekeeping notes in last month's "Journal".

Once honey has begun to ferment no amount of heating or other treatment will remove the sour flavour produced by fermentation.

Sale of Surplus

Many domestic beekeepers produce each season more honey than is required for their households. In packing any surplus intended for sale attention should be paid to cleanliness and uniformity of colour and condition. Containers that compare favourably with those used by commercial producers should be used. Clean honey can be obtained by straining the honey carefully through two thicknesses of cheese cloth before it runs into the settling tank; uniformity can be obtained by blending different honeys to a colour that can be duplicated easily each year in the particular locality.

A continuous demand for honey and good prices depend on a good, clean, well-packed product.

Two top supers of surplus honey in a domestic apiary ready for harvesting.

Show Dates

THE following are dates and venues of A. and P. shows up to April 7.

*March 17—Methven A. and P. at Methven.

March 17—Cheviot A. and P. at Cheviot.

March 17—Upper Clutha A. and P. at Wanaka.

March 17—Wellsford A. and P. at Wellsford.

*March 26—Mackenzie County A. and P. at Fairlie.

March 26—Strath Taieri A. and P. (jubilee show) at Middlemarch.

*March 31—Hawarden A. and P. at Hawarden.

March 31—Waverley A. and P. at Waverley.

April 7—Oxford A. and P. at Oxford.

* The Department of Agriculture exhibit will be staged at this show.

Hoist Race for Loading Sheep on to Double-decker Truck

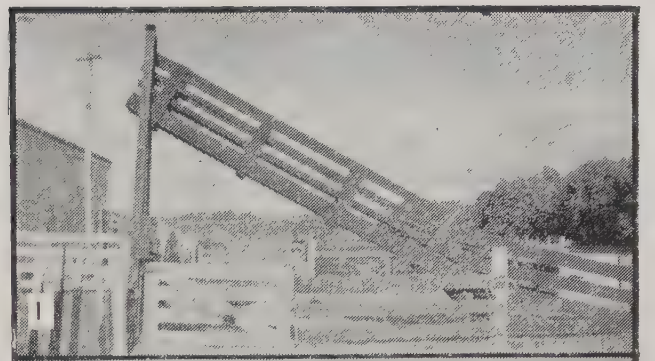
By C. G. JOWSEY, Fields Instructor,
Department of Agriculture, Pukekohe.

LOADING of sheep and lambs on to the top deck of a double-decker truck is the cause of much waste of farmers' and truck drivers' time. Even with a suitable loading bank and makeshift pens sheep often have to be lifted some 4 or 5ft. and are then liable to injury.

The hoist race shown on this page was designed and built by Mr. J. S. Kidd, of Waiau Pa, Patumahoe, Auckland, and it has made the loading of stock on to trucks on Mr. Kidd's farm much easier.

* * *

Fig. 1—Loading race raised; it can be elevated to 9ft. Fig. 2—The telescoping action of the race; this is essential to get the required length when the race is lifted to the top deck. Fig. 3—The hoist mechanism—a 1¼in. shaft with handle brazed on. A 3/16in. steel wire rope is passed through holes in the shaft, up to single pulleys, which are wired on to the top cross-piece, and down to the race. Fig. 4—The approach is constructed of wood, but concrete is recommended (see diagram), as signs of decay are appearing where the race comes in contact with the ground. For ease in cleaning the race, spaces are left between the ends of the cleats in the race, and the walls.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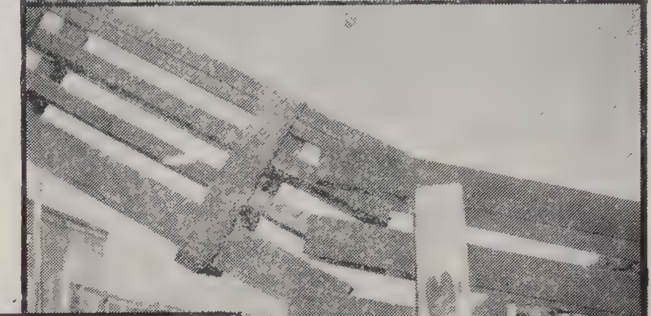
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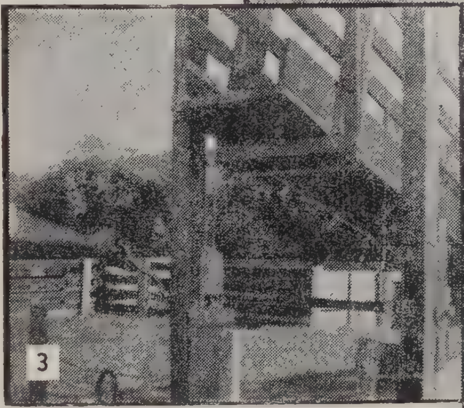
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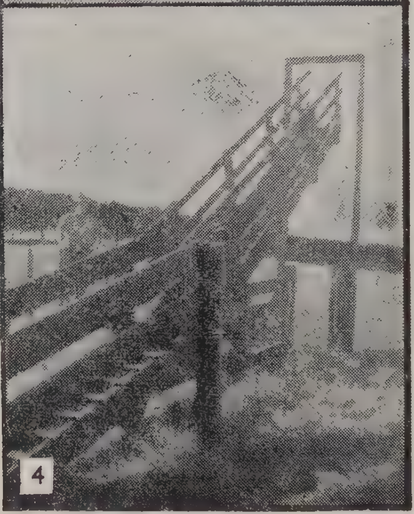
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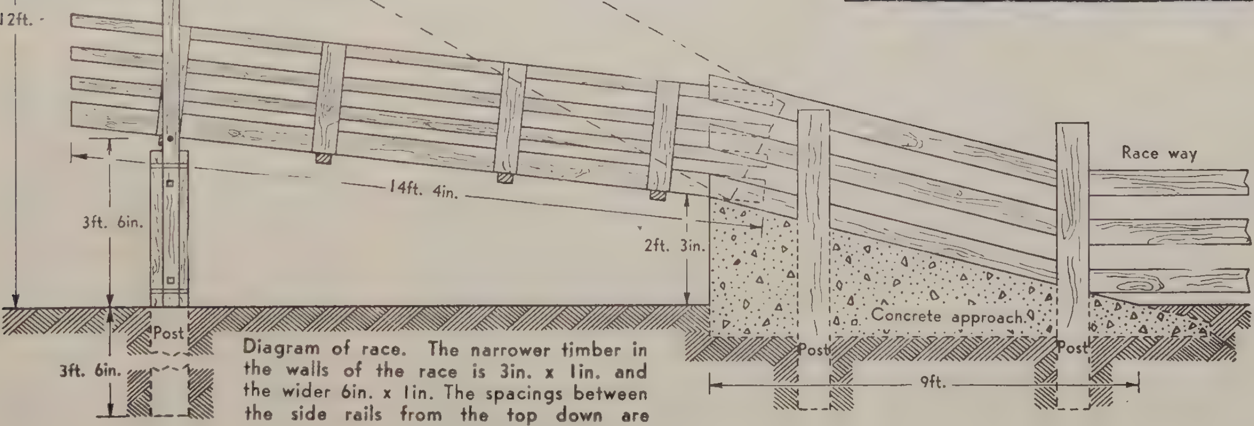


Diagram of race. The narrower timber in the walls of the race is 3in. x 1in. and the wider 6in. x 1in. The spacings between the side rails from the top down are 5in., 4in., and 3in.

Efficient Use of Pasture on Rotorua Farm

By C. R. TAYLOR, Instructor in Agriculture,
Department of Agriculture, Rotorua.

MOST grassland farmers at some period of the year fail to utilise fully the pasture herbage produced by the present recognised methods of good management. The extent to which avoidable waste takes place is an indication that the advantages to be secured from the use of good seed, liberal topdressing, high-quality stock; etc., are not the benefit to the farmer concerned that they could and should be. Waste represents loss of income or deterioration of assets, or both; where it relates to pasture utilisation often both income and assets are affected. This has been realised by a progressive young farmer in the Rotorua district, Mr. M. C. Wiggins, whose experience is described in the following article.

MR. WIGGINS took over the leasehold of 83 acres as a going concern in January, 1943. The farm had all been previously ploughed and grassed at different periods, but at the time of taking over Mr. Wiggins found that 23 acres had reverted to gorse, and most of the remainder of the pastures were showing a good deal of sweet vernal and other inferior species. The stock taken over under the lease comprised 33 milking cows and 2 draught horses.

Fortunately the farm had been fairly well subdivided; not only was it provided with a conveniently situated central race leading from the cowshed, but it had 13 paddocks ranging from 2 to 14 acres as well. Subsequently 4 additional subdivisions were added, making 17 paddocks in all, none of which exceeded 7 acres.

For the remainder of 1943 and the two following seasons the property was run in conjunction with a smaller town-supply farm about 8 miles away. As this was a period of settling down and as during the period full records were not kept, nothing further concerning it will be recorded except that it was mainly during this interval that Mr. Wiggins worked out his future course of action based on his experiences up to that date.

From August 1, 1945, the farm was run as a single unit entirely on town supply. By this time, despite the serious shortage of fertiliser due to the war, the old pastures had been improved considerably by fairly strict rotational grazing of both day and night paddocks and by the regular use of the harrows to spread stock droppings. About 14 acres of new grassland also had been laid down.

Fertiliser Treatment

During the past 4 years 12 tons of serpentine superphosphate have been used annually for topdressing, which is equivalent to 3cwt. per acre. This is always applied as early as possible in autumn to encourage the maximum winter and early-spring growth, which are essential for herds being milked over this difficult season for town supply. Serpentine superphosphate is preferred to superphosphate because it has been found to be at least equal to superphosphate in the total production of pasture herbage. Moreover, it can be stored without its rotting the bags and it will not burn pasture if sown in dry weather. When it is found necessary to sow down new pastures 5cwt. per acre of fertiliser is applied with the seed, and this is followed by a further 3cwt. in 3 months' time. Thereafter only 3cwt. is used.

Pasture Management

Up to May, 1947, Mr. Wiggins continued with his system of day and night paddocks rotationally grazed and harrowed. After that it was abolished, the milkers being run night and day in the same paddock until it was eaten down to about 2½in. After that the dry cows were turned in to clean up what remained of the herbage, the field then being thoroughly harrowed and spelled. This method was found to have a number of important advantages over the old one, among which was a noticeable improvement in the former day paddocks, especially in regard to more rapid recovery following grazing, fewer tufts of waste grass, more ryegrass and clover, and fewer weeds.

Use of Electric Fence

The changed grazing and harrowing technique was closely followed for the next 12 months and so pleasing were the results that Mr. Wiggins decided to intensify the system. Accordingly he purchased an electric fence and with it rationed the pasture in each paddock to his milkers (40 to 50 according to season) at the rate of from 1 to 2 acres every 24 hours. In this way the herd got fresh pasturage every day, each field yielded more useful grazing because no herbage was wasted, and the distribution of animal manure and urine was much more efficient.

It is claimed that this system, although it involves shifting the electric fence each day, has definite advantages over the system of using very small permanent paddocks, as seasonal growth can be taken into consideration more adequately when arranging the size of break each day.

Immediately after the milking herd has taken the choicest portions of pasture in each paddock the dry stock are turned in to clean up the remaining herbage to avoid waste.

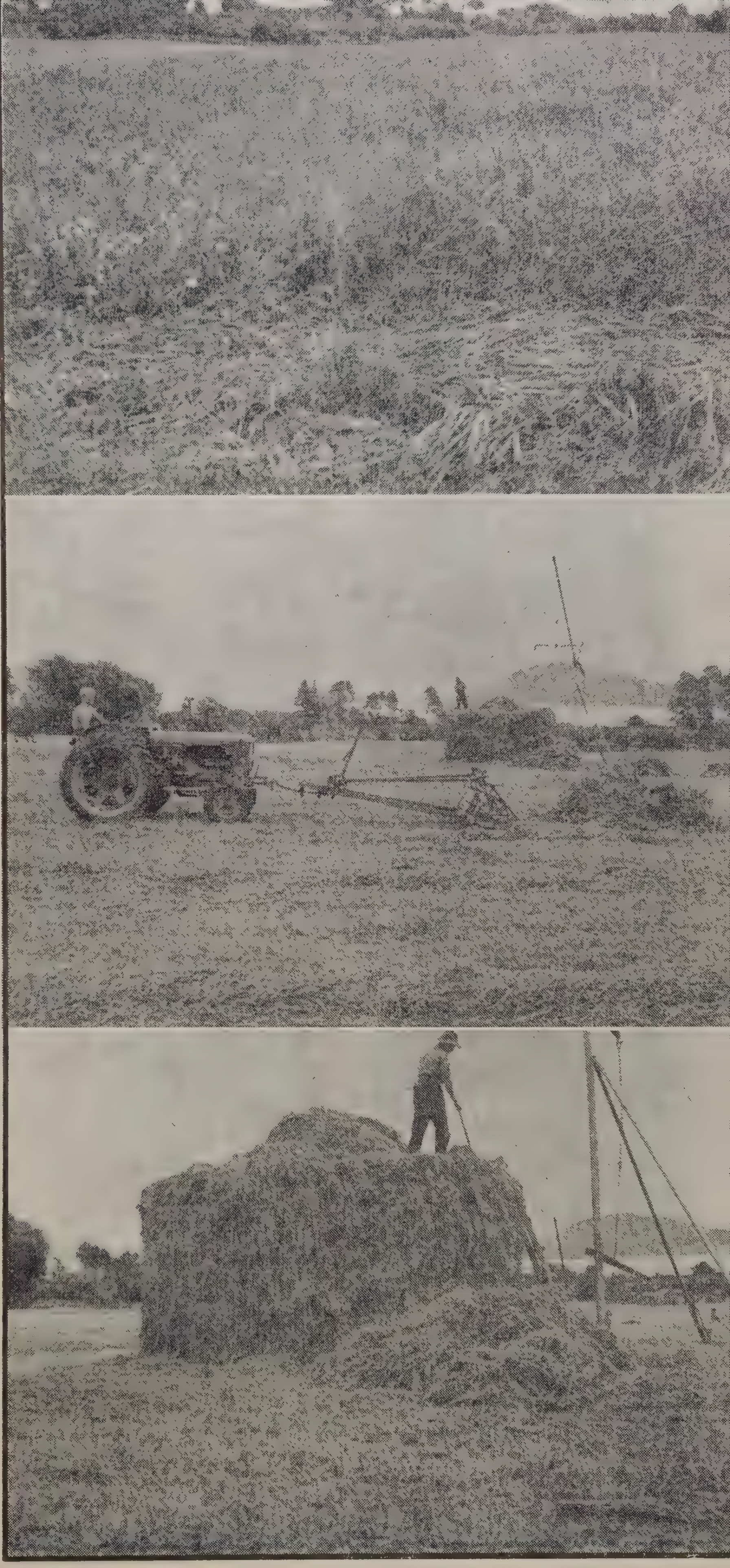
The paddock then receives a thorough harrowing—by this time it is most necessary—and is then completely closed, to facilitate recovery, for periods ranging from 20 days in the flush of the season to 90 days when autumn-saved grass is being fed off.

HEADING PHOTOGRAPH: Intense control of pasture growth by use of electric fence prevents wastage and encourages even grazing. Stock are given a fresh break of pasture every 24 hours.

It may be thought that Mr. Wiggins's system of rationing pasture to his milkers **all the year round** would be tedious and more suited to the enthusiast than to the everyday dairy farmer, but the shifting of the electric fence to its new location, according to the size and shape of field, takes only 15 to 30 minutes each day. The electric unit has been made portable by fastening it to a light framework mounted on two old sweep wheels. To facilitate handling the necessary length of wire (aluminium barbed wire is used because of its lightness) there is a small hand winch on the portable trolley. For posts, light steel standards cut to a length of 4ft. are used. They are relatively light and easily driven into the ground. Insulators are bolted on near the tops of standards, and rubber rings cut from old inflations are used to fix the wire securely to insulators. The equipment is easily moved from paddock to paddock, and, as it is self-contained, it eliminates the need for long lengths of straggling wires to conduct current from a central station on the farm to where the fence is being used.

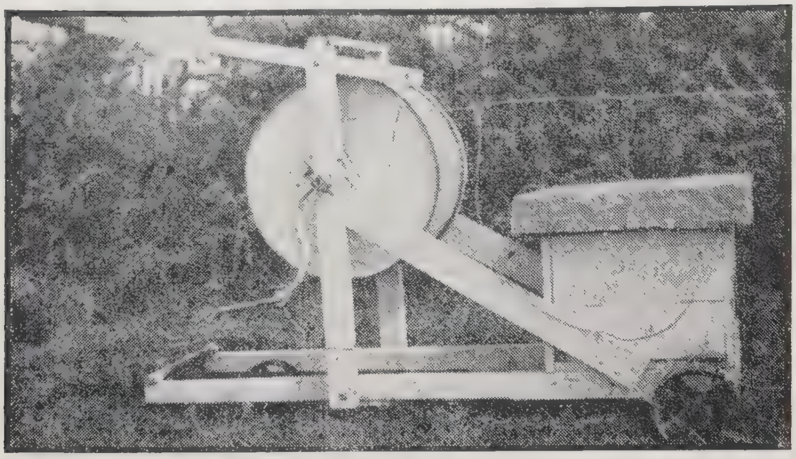
Silage and Hay

As Mr. Wiggins aims to milk between 40 and 50 cows the year round on his 83 acres and, when required, to carry 10 to 20 in reserve for calving to meet the demands of a town-supply service—that is, a cow to approximately 1⅓ acres—it is apparent that he would need to provide substantial quantities of other foodstuffs to supplement pasture growth during the period of its lowest production, in winter. Here again Mr. Wiggins's pasture-management technique stands him in good stead, for it enables him to harvest up to 40 acres of his 83 acres for silage in October-November, and later, in January, an additional 20 acres for hay. In 1948-49 he made 6 stacks of silage, 5 of which when opened up proved to be almost perfect; the sixth was not used and 500 bales of hay were also left over to be carried forward to next year. Four of the silage stacks were entered in the local field-crop competitions and three were placed first, second, and third respectively in their section, a meritorious performance. The previous year Mr. Wiggins won first and second prizes with two of his three silage entries, thus proving conclusively that he is as adept at making good silage as he is at growing good grass and using it without wasting any.



Upper—One of several fields of surplus pasture growth being harvested for silage in late October. It was the third field harvested for silage during that month. Note the leafiness of the herbage—ryegrass, cocksfoot, prairie grass, and white clover. Middle—Harvesting scene in same field as shown in the upper illustration. Only 2 men do all the work. Lower—While the second man is sweeping in more material Mr. Wiggins carefully spreads out what has been dumped on top. Great care is taken to keep the stack upright and to tramp the sides well while keeping the centre slightly raised or hearted up.

EFFICIENT USE OF PASTURE GROWTH



Side view of electric fence unit showing the winding drum for wire, the brake (lever at top) to control the speed of the drum when the wire is being unwound, and the box containing battery, etc. The general construction of the portable assembly is also clear.

For silage, paddocks are usually shut up in August, or as early as possible, to enable harvesting to begin by mid-October, when the herbage is leafy and lush and its nutritive value is highest. Quality rather than quantity is Mr. Wiggins's slogan in all his farming operations, especially in relation to feed for his stock. Only two men (the owner and another worker) are required to make all the silage used on the farm and it takes between 4 and 6 days to complete each field, depending on its size and the weather at the time.

Usually 1½ to 2 acres are mown late in the afternoon while one man does the milking; if time permits, the material is put into windrows. About 8 a.m. the following day stacking of material cut the previous day is started. The stack will be 5 or 6ft. high at the end of the first day. The same procedure is repeated until the stack is completed, when 6 to 9in. of earth is placed on top of the silage to weight down and seal from the air the last few feet of material. Once harvesting is started the work proceeds until the stack is completed.

Hay paddocks are usually closed up in October so that cutting and baling can be done in December or early January. This work is always done by a contractor, as Mr. Wiggins has never considered it worth while to purchase a baler.

Root Crops

Since intensifying his system of rotational grazing and strict control over pasture growth with the electric fence Mr. Wiggins has not found it necessary to plough up good grassland for swedes and soft turnips as he was once compelled to do. It has been found that with almost complete avoidance of waste of pasture the surplus not immediately required for stock, plus a little meal, is sufficient when properly saved as silage and hay to meet the entire winter needs of 60 head of mature dairy cows, 40 to 50 of which are in milk over the whole winter season.

In the years when roots were customarily grown it was usual to provide 7 or 8 acres of swedes for winter feeding, and in the same ground as a second crop soft turnips were sown later for summer use. Ploughing out of the grass was undertaken during October and the swedes were sown in the third or fourth week in November. Good cultivation was always a feature of the preparation of land for roots, but rolling was never done. In the autumn of the second year, after the soft turnips were finished, the area was resown to permanent pasture, the composition of the mixture (all Certified seed) being as follows:—

	lb.
Perennial ryegrass	25
Italian ryegrass	5
Cocksfoot	8
Montgomery red clover ..	2
White clover (Mother seed) ..	2

Feeding Out

Feeding out is governed largely by the seasons. When roots were being grown soft turnips would generally be fed out in the dry period of January and February. Roots were followed by silage during autumn and swedes and hay in winter. Between 6 and 8 tons of meal, fed in the bails, would also be consumed by the milkers over the 4 months of winter. Turnips were always pulled and fed out on grass, and swedes were grazed in small breaks for an hour or so immediately after the morning milking to avoid taint in the milk.

In the 1948-49 season, when no roots were grown, silage feeding began on February 10 and continued without a break until August 17, by which time there was ample pasturage available to satisfy the complete needs of all stock. During this period no thought was given to the rationing of silage to stock, the practice adopted being that of feeding out as much as the animals would eat without wasting any. Hay to supplement silage and rationed grass was fed from April 27 to September 25 at the rate of from 4 to 6 bales per day, and the milkers also received a very small allowance of meal from May 15 to August 15.

Thus, through the strictest control of pasture growth throughout the whole year, Mr. Wiggins has found it not only possible but advantageous to replace 7 to 8 acres of swedes and a similar area of soft turnips with previously wasted surplus pasturage converted into extra silage and hay. All the costs incidental to cropping—ploughing, cultivation, seed, resowing to pasture, etc.—are now avoided, and stock maintain their condition better over the winter and are much more productive. Only in the rare event of a pasture deteriorating to the point of being uneconomic would it now be ploughed and cropped before being resown to permanent pasture.

Herd

As it is a town-supply farm, Mr. Wiggins keeps no calves for replacement purposes and all cows necessary to maintain production are bought as springers. No particular breed of cattle is favoured, although Jerseys predominate, as the main consideration in this type of dairy farming is to keep up an agreed-upon minimum quantity of milk, which often involves purchasing at odd times cows of any breed, provided their calving dates are right and they are otherwise suitable. No hand stripping has been practised for two seasons.

Production

A description of Mr. Wiggins's farming practices and experiences would not be complete without production figures, especially as they indicate clearly the progress made since 1947, when the change-over in pasture management was made. The more intensified form of control by use of the electric fence is further reflected in the 1948-49 figures. During each of the 4 years an average of 45 cows was milked over 365 days, production being as follows:—

Season	Total gallons	Gallons per acre
1945-46	.. 25,685	309
1946-47	.. 26,043	313
1947-48	.. 28,398	342
1948-49	.. 30,511	367

Expressed on a butterfat-per-acre basis, assuming the milk to average 4.5 per cent. of fat, the position is:—

	Butterfat lb.		Butterfat lb.
1945-46 ..	139.0	1947-48 ..	153.9
1946-47 ..	140.8	1948-49 ..	165.2

The above figures may not appear to indicate anything remarkable in production, but it must be remembered that milking a herd for town supply, which involves winter milking and the calving of cows at unusual times, is very different from milking a larger herd over the most productive part of the year only. For this reason town-milk suppliers are paid an allowance to compensate them for the recognised lower annual production of their herds compared with those of factory suppliers.

The high level of production on Mr. Wiggins's farm is not the result of employing some new technique or of spending large sums on elaborate equipment. What Mr. Wiggins is doing could be done, subject to necessary modifications to suit local conditions, by most dairy farmers.

The Home Garden in April

By H. P. THOMAS, Vegetable Instructor, Department of Agriculture, Wanganui.

BECAUSE of the approach of colder weather in all districts, very little seed sowing should be done during April. Where seed sowing is attempted a fertile, well-drained soil with a favourable aspect is essential if results are to be satisfactory. If conditions are considered suitable, small sowings of lettuce, spinach, broad beans, beetroot, turnip, carrot, radish, and onions can be made. In some districts an early sowing of peas can be tried, although if the crop is planted too early, it may fail to set pods if unfavourable conditions are experienced. In most instances it is advisable to make winter sowings and plantings on ridges or raised beds, as these give better drainage and consequently higher soil temperature.

CONDITIONS are more favourable for planting out strong seedlings from earlier sowings than for the sowing of seed, but the choice is limited to such plants as cabbage, cauliflower, lettuce, and silver beet. Frequent applications of liquid manure will assist plants when they have become established. With little sowing and planting to be done at this time of the year time is available for other important work such as digging, building up soil fertility, composting, and tidying up.

Good garden hygiene, which is always necessary, is particularly important at this time of year. Co-operation in this respect is essential in a locality where there are many gardens, as a neglected garden in an otherwise well-managed area will cause much trouble to its owner and to his neighbours.

No diseased refuse or crop residues should be allowed to lie about the garden. Diseased crops, especially tomato vines, potato haulms, and pea and bean foliage, which may be affected with virus, should be destroyed by burning. All disease-free material should be composted. Older compost heaps may now be ready for use and partly matured heaps will benefit by turning, which hastens decomposition.

Regular hoeing should be carried out at every opportunity to eliminate weeds, which are likely to act as hosts for various pests and diseases. Such general everyday maintenance will assist greatly in the fight against pests and diseases in the home garden. Vacant areas should be dug now and new ground broken in. If the land is not required for a winter crop, it should be sown with a cover or green crop. Such crops suppress weed growth and when full grown are dug in to build up the humus content of the soil. Opportunity should be taken at all times to replenish the organic material in the soil by adding this material in some form. Besides supplying plant food organic material stimulates biochemical activity and improves the physical structure of the soil greatly.

Green-manure Crops

Where farmyard manure, compost, or leaf mould is not available special attention must be given to the sowing of green-manure crops. Many plants can be used; they include mustard, oats, barley, vetches, clovers, and blue lupin. The last three are especially useful where the nitrogen content of the soil is low.

[*Green and Hahn Photography Ltd. photo.*

No refuse should be left about the garden; what is unsuitable for compost should be burnt.

Blue lupin is a favourite, particularly for an autumn sowing; it takes approximately 20 weeks to reach the flowering stage, which is considered the best time to dig it in. To get the maximum benefit from a lupin crop this year it will therefore be necessary to sow seed of it now. For general purposes, mustard (agricultural) is excellent, as it produces much soft growth within a period of up to 14 weeks. Its succulent growth, which is easy to dig in, decays quickly and becomes available early for the succeeding crop. It also has the added advantage of being a fairly good deterrent for wireworms if they are present in the ground. The seed of cover crops need not be dug in deeply, but should be just covered after being sown broadcast or in drills.

Crops such as potatoes, kumaras, pumpkin, squash, marrow, and melon should be harvested now, particularly in districts which experience early frosts. Earlier-planted crops of broccoli, cauliflower, cabbage, brussels sprouts, and curly kale will benefit from moulding up as they grow, as the ridges thus formed give the plants support during stormy weather and improve soil drainage, which is often necessary, particularly with winter crops in heavy soils. Toward the end of the month, if more room is required, root crops such as carrots and beetroot can be lifted and stored.

[*Sparrow Industrial Pictures Ltd. photo.*

Blue lupin is a favourite green crop for sowing in April. The nitrogen content of the soil is increased if this leguminous crop is left until the flowering stage before it is dug in.

THE HOME GARDEN IN APRIL

[*Sparrow Industrial Pictures Ltd. photo.*

A green crop of mustard sown broadcast. As well as building up the humus content of the soil this crop is a good deterrent for wireworms if they are present.

Asparagus

The top growth should not be removed from the asparagus bed until the foliage begins to turn yellow, but it should be done before the seeds are ripe. The change of colour indicates that the foliage has fulfilled its purpose and is no longer of use to the dormant crowns. If the seeds are left to ripen, they will fall and germinate in spring, and seedlings will have to be removed later to avoid overcrowding the bed, which is detrimental to the established crowns. After the removal of the top growth is a suitable time to increase the depth of topsoil and improve the humus content by applying a light dressing of compost or clean soil mixed with well-rotted farmyard or poultry manure.

Carrots

Although April is too late to sow carrots in most districts, small sowings may be tried on light, well-drained soils where growing conditions have usually proved favourable. A position where the crop will get all available sunshine should be chosen.

Carrots are more likely to succeed if sown on ridges or in raised beds. Where flat-topped ridges are used the seed is usually sown broadcast in a row 6in. wide and ½in. deep. The seed is sprinkled thinly along the drill and covered with ¼in. of fine soil, which should be gently firmed.

If a raised bed is used, a width of not more than 4ft. is recommended for convenience in sowing and cultivating. Rows can be 6 to 9in. apart and should run across the bed so that subsequent weeding and cultivation can be done without the gardener having to tread on the bed itself. If a fertiliser is considered necessary, equal parts of superphosphate and sulphate of potash at 2oz. per square yard can be applied. It should be well mixed with the soil when the final preparation of the bed for sowing is being done. As the plants seldom grow to their full size when sown at this time of the year, thinning may not be necessary, but if it is necessary, it can be regulated according to the progress of the crop.

Good varieties for sowing now are the short carrots such as Early Horn, Scarlet Horn, Early Gem, Early Crop, and Early Nantes.

Celery

In most districts celery will have reached its maximum development by now, and if blanching has not been done on all plants, no time should be lost in carrying out this work, which was described in last month's "Journal". If possible, it is a good practice to blanch an area of plants in succession, so that the period over which good-quality sticks can be harvested may be extended. If a large number of plants is blanched at the same time, it may not be possible to use them all before the last sticks become pithy and tough. Successive, small plantings will also assist in overcoming a glut. Regular spraying with Bordeaux mixture or other suitable copper fungicide should not be neglected, as celery leaf spot (*Septoria apii*) spreads rapidly in the moist conditions which usually prevail in late autumn. With attention to successional plantings, blanching, manuring, and regular spraying celery should be available throughout winter.

Kumaras

Kumaras, which are grown mainly where the climate is warm, should be harvested during April, as little benefit can be expected by leaving them in the ground longer. Remove the tops before digging the tubers very carefully with a fork. Tubers accidentally damaged in any way during lifting can be sorted out and put aside for immediate use.

For storing, select all the undamaged tubers and spread them on sacks in a sunny position for a few days so that they can dry thoroughly. (If the tubers are on sacks, they can easily be moved indoors at nights or during showery weather.) Wrap tubers separately in paper, preferably brown paper, and put them in a box or barrel in layers between which perfectly dry sawdust is placed. The containers should be stored in a dry place in a shed where the temperature is moderate. A lid or cover should be put over the container as a protection against rats and mice.

Provided kumaras are handled carefully and stored properly, they will keep in fairly good condition throughout winter.

Marrows, Pumpkins, and Squash

In districts where frosts of more than a few degrees can be expected marrows, pumpkins, and squash should be harvested now. Even comparatively light frosts may cause minute injuries to young fruit and so provide a suitable source for infection by fungous diseases. Fruits which have a skin sufficiently hard that it cannot be easily penetrated by the pressure of the thumb nail should be chosen for storage. As rotting caused by insect attack or mechanical injury is common in late autumn, it is advisable if wet conditions are being experienced, to keep swelling fruits off the ground; slabs of wood or sheets of glass can be placed beneath them.

Fruits should be ripened off in a glasshouse or in a sunny situation for up to 10 days and then placed in a dry airy place where a favourable temperature can be maintained during storage. Underneath the house is suitable where better facilities are not available, though it is better to place fruits on edge on shelves in a dry well-ventilated shed.

Onions

A sowing of onion seed may be made in the North Island in early April for the production of plants which are usually transplanted into their permanent positions in late July or early August. The prevalence of mildew in some northern districts in summer is one reason why autumn sowing is often preferred, as autumn-sown plants are usually well developed before mildew attack becomes serious.

For autumn sowing the ground should be deeply cultivated and broken down to a fine tilth; slightly raised seed-beds may be made to give good drainage, and finally the ground should be firmed. However, care must be taken where the soil is heavy to avoid firming it too much, as heavy soils tend to consolidate excessively where they are subjected to frequent winter rains. Soil to which well-rotted compost and a dressing of 2 parts of superphosphate and 1 part of sulphate of potash at 4oz. to the square yard have been added will produce strong plants. **Varieties** suitable for autumn sowing are Pukekohe Long Keeper (the most widely grown variety), Brown Spanish, and Straw Spanish.

Broad Beans

In southern districts some growers make a sowing of broad beans toward the end of April. Very early sowings, however, are not advisable, although where success has been achieved a repetition of the practice is justified. If broad beans are planted very early, they usually fail to set pods when unfavourable conditions are experienced during late winter and early spring.

Broad beans will grow in almost any type of soil provided that it is well drained, but they have a preference for a fairly heavy soil rich in organic matter. Seed is usually sown in double rows about 6in. apart, allowing 4ft. between rows. Two main types the Broad Windsor type and the long-podded type, are grown in New Zealand. The Broad Windsor type is considered to be of superior flavour, but the long-podded beans are earlier and yield more heavily.

Leeks

Growing leek plants should be kept free of weeds and copiously watered if the weather is dry. As leeks are gross feeders, they should be grown in a rich soil well supplied with organic matter. Few vegetables respond better to liberal dressings of animal manure, which should be applied to the soil before planting and as the plants grow. It is now too late to remedy mistakes which may have been made before planting, but side dressings of liquid animal or fowl manure will greatly assist plants during their growing period. If animal or fowl manure is not available for liquid manure, nitrate of soda, 1oz. in 4 gallons of water, may be substituted. When the ground is dry water it before applying liquid manure.

Potatoes

In most gardens the digging and storing of main-crop potatoes will now be a first consideration. The crop should be lifted when the top growth shows general dying off. Tubers are mature when their skins are firm—skin should not come off easily when rubbed with the fingers. If possible, a fine day when a breeze is blowing should be chosen for digging the crop, and it is advisable to dig only as many potatoes as can be dried and picked up during the day. Leaving bags exposed overnight or covering them with haulms is inadvisable, as it may lead to infestation with potato tuber moth.

Potatoes should be lifted and stored with care or their keeping quality will be impaired. Only specimens free from damage or disease should be selected for storage. Because of the small quantity of potatoes usually stored by home gardeners, pits or clamps rarely need to be constructed. If potatoes are put in a cool shed in boxes with a top covering of dry straw to exclude the light, they will keep in perfect condition for months. An alternative method, if space is available, is to lay the tubers out on straw in a darkened cellar or shed and cover them with more straw.

In the warmer districts of the North Island a watch should be kept for developing shoots, which should be rubbed off. Tubers intended for seed can be put aside for greening and sprouting later, although as a precaution against disease the use of new Government-certified seed is recommended.

Spring Cabbage

In most districts young cabbage plants are set out during April to provide early-spring supplies to follow the harvesting of savoy cabbage. If seed has been sown in early autumn as advised, another batch of young spring cabbage plants should be ready for transplanting. For these plantings the situation should be sheltered and should where possible have a northerly aspect to obtain the benefit of maximum sunshine. At this period of the year setting the plants out on ridges is a definite advantage in some localities and it should be given a trial where soil drainage is not good during winter.

A complete fertiliser should also be incorporated in the soil before planting; a mixture of 3 parts of blood and bone, 1 part of superphosphate, and ¼ part of sulphate or muriate of potash, applied at 4oz. to the square yard, should give a ready response on most soils. Liming is necessary on most New Zealand soils for this crop and a topdressing of carbonate of lime at ¼lb. per square yard should prove beneficial.

Early-maturing varieties may be planted 15in. apart and later varieties 18in. apart.

Early-maturing varieties are Flower of Spring, Springtide, and Early Offenham, and **second-early varieties** (maturing about 2 weeks later) Charleston Wakefield, Enfield Market, and Golden Acre.

Spring Cauliflower

The requirements of cauliflowers are similar to those of cabbage, except that cauliflowers are not as tolerant of adverse soil and weather conditions as the latter crop, and in unfavourable localities it is best to delay planting of cauliflowers until July, August, or even September. Extremes in weather conditions at a critical stage usually check the plants, causing the curd to button instead of reaching usable size.

Varieties suitable for planting now in favourable localities include All Seasons, Walcheren, Phenomenal (5 months), and Phenomenal Main Crop. If plants are not available from seed sown recently, they can usually be obtained from seedsmen.

Tomatoes

Stopping of the main leaders of tomato plants should have been done by April, although at this time of year it is advisable to leave as much of the foliage as possible to protect the remaining fruits. Where fairly sharp frosts are expected all nearly mature fruits should be gathered.

Very little green fruit need be wasted. The largest can be ripened after being picked and the smallest can be used for chutney, jam, or pickles. Several ripening processes can be tried, although the quantities of fruit to be ripened by the home gardener are usually small. Plants can be removed by the roots with fruits still attached and can be hung in a dry, warm, and sunny room, shed, or greenhouse; it will be found that a large percentage of the fruit will ripen on the vines. Another method is to pick the fruits and place them on a shelf in a greenhouse or pantry, spacing them so that they do not touch. It is not advisable to expose them in a window to the full heat of the sun, as they are likely to be scorched.

Root Crops

In the South Island root crops such as carrots, parsnips, beetroot, and swedes store well, but in many parts of the North Island carrots and parsnips in particular cannot be kept in storage for long, because in these districts the relatively high temperatures during winter are favourable for the development of storage rots. For this reason carrots and parsnips are best left in the ground in some districts unless the area they occupy is required for other crops. Carrots keep better if lifted before frosts begin. After the leaves have been cut off close to the tops, carrots may be pitted upright in the ground with their tops level with the surface or embedded in sand in the same manner.

Carrots should be stored in the coolest part of the garden or in a cellar. A moderately moist atmosphere is desirable, as dryness causes

[Green and Hahn Photography Ltd. photo.

Pointed, oxheart, or spring cabbage is usually planted out in autumn so that it matures in spring and adds variety to the limited supply of fresh vegetables then available.

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PROGRESS

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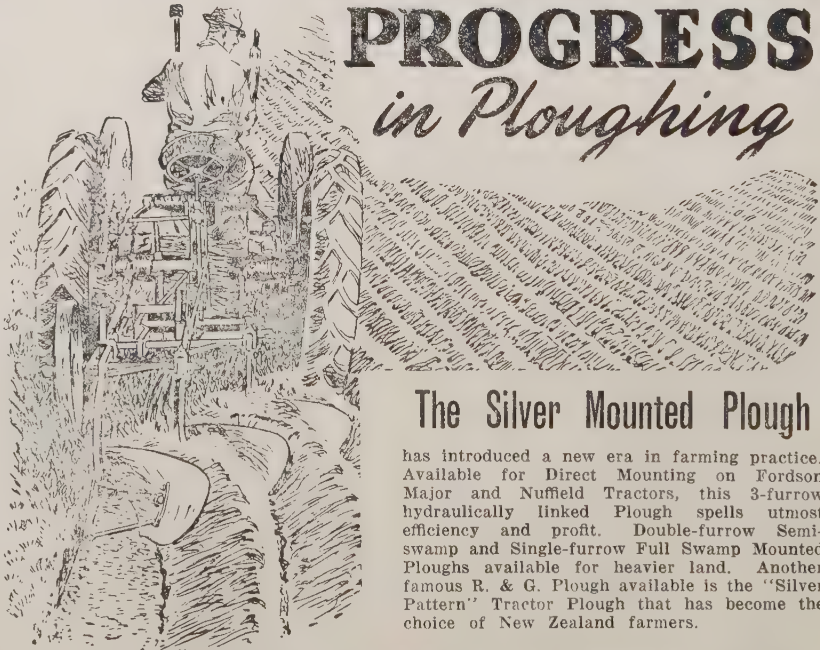

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severe shrivelling. Carrots keep best at a temperature of 2 to 3 degrees above freezing point.

Late-planted beetroot are preferred for storing, as the earlier sowings tend to become woody by storing time; the latter should be used during summer and autumn. Roots kept for storage must be handled very carefully, as the skin is easily damaged. The leaves of beetroot for storing should be twisted off 2 or 3in. from the crown; plants showing a developing flower stalk should not be used. Beetroot, also turnips and swedes, may be stored in the same manner as given for carrots. Parsnips may be treated similarly, although they do better and are improved in flavour if left in the ground and the roots used as required.

Garden Mint

Garden mint, which is used principally for flavouring and for mint sauce, will need some attention at this time of the year. As it is a vigorous grower, it soon impoverishes the soil, and the growths become smaller unless manure is added annually or the herb is put in a new position. Weeds should be removed, old top growth of mint should be cut away, and a mulch of decayed manure or compost should be applied.

Because of the spreading habit of mint, new plantings should be surrounded by a cut-down 40-gallon drum with the bottom removed or similar surround made from discarded material. Another method of preventing mint from spreading is to grow it in a box or tub provided with ample drainage and placed near an outside water tap. Mint grows best in moist situations in partial shade and may be propagated very easily from rooted cuttings of the creeping stem.

Digging and Trenching

Cultivation, which has a marked effect on the standard of vegetables harvested, begins with thorough preparation of the ground. Deep digging in the correct way is most important in the production of good-quality produce. It is advisable not to dig during wet weather, and the surface should be left rough to benefit from the action of air, sun, and frost.

[Green and Hahn Photography Ltd. photo.

This is the time of year for digging vacant areas or breaking in new ground.

Any organic material (farmyard manure, a green crop, or compost matter) that is dug in should be incorporated throughout the soil instead, as is often done, of being sandwiched between the topsoil and the subsoil. Four methods of cultivating the soil which can be resorted to by the home gardener, apart from hoeing, which is often referred to as surface cultivation, will be described.

Ordinary digging (Fig. 1) to the depth of approximately 1ft. is satisfactory on good soil which previously has been deeply dug. Digging in this manner will never give good results if the subsoil has not been broken up, because the roots of some crops will not penetrate a hard, often sour, subsoil.

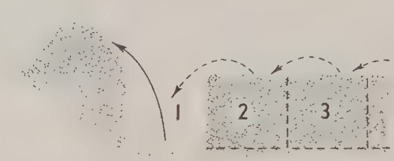


Fig. 1—Ordinary digging. Remove 1 and throw it forward; 2 is thrown into the trench formed by removing 1, and the procedure is continued with 3 and succeeding spadefuls.

Double digging (Fig. 2), often referred to as mock or bastard trenching, although not as effective as proper trenching, is most commonly practised, and for the majority of crops it gives excellent results. In double digging the topsoil is taken out to form a trench, preferably 18in. to 2ft. wide and 1ft. deep for convenient working. The topsoil from the first trench is put aside for filling in the final trench, which will be left when all the plot has been dug. The subsoil is well dug with a fork or spade and any organic manure, compost, or green material available is incorporated in this layer. The subsoil is not removed, but is broken up and liberally enriched to improve its texture, drainage, and fertility.

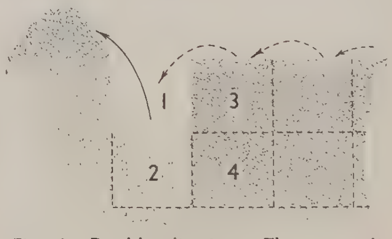
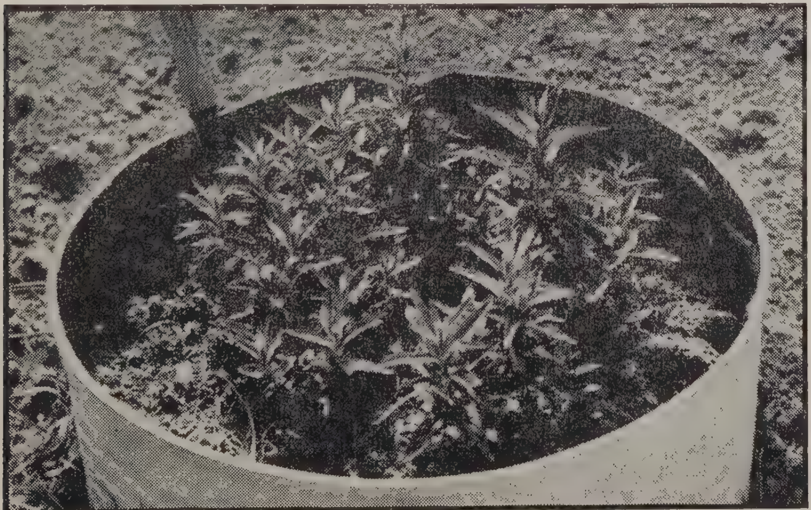


Fig. 2—Double digging. The top spit (1) is removed; the second spit (2) is not removed, but is broken up and enriched. Then 3 is turned into 1 and 4 is treated in the same manner as 2. This procedure is continued to the end of the plot.



[Green and Hahn Photography Ltd. photo.

To prevent mint from spreading throughout the garden it should be grown in a section of a steel drum or in a bottomless box sunk in the ground.

WORK IN THE HOME GARDEN IN APRIL

Full or ordinary trenching (Fig. 3): A trench 18in. to 2ft. wide is made to a depth of 2ft. The top spit is then turned into the bottom of this trench and the second spit, which is usually of a subsoil nature, is brought to the surface. This method is seldom used unless the second spadeful from the surface is similar to the topsoil in quality. Exposure to weather improves the fertility of the soil, but if the soil type is one in which several inches of soil rests on heavy clay, it is most unwise to bring the subsoil to the top. Hence this method may be considered only where the soil is very deep and has been dug in the ordinary way for a few seasons, but it should not be practised on new ground.

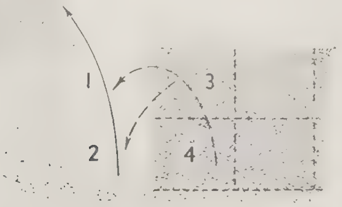


Fig 3—Full trenching. Soil two spits deep (1 and 2) is removed, 3 is thrown into the position from which 2 was taken and 4 into the position from which 1 was taken. The procedure is repeated until the plot has been dealt with.

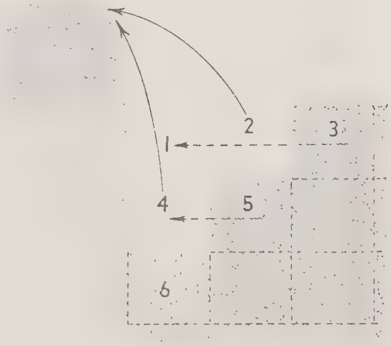


Fig 4—Deep trenching. Soil is taken out from 1, 2, and 4; 6 is broken up and enriched; 5 is placed in 4, and 3 in 1. This method of working is continued to the end of the plot.

Proper or deep trenching (Fig. 4), which is seldom done because of its laborious nature, is carried out in the same way as mock trenching, but cultivation is done to a depth of approximately 3ft. A double trench of topsoil is first removed (the trench should be wide enough for convenient working of the third spit) and the operator, by standing in the trench just made, then takes out a second spit. The two amounts of surface soil and that from the second layer should be kept separate and placed conveniently nearby for finishing off. The third spit of the deeper trench is dug over, but not removed, and farmyard manure, compost, or garden refuse can be spread in it as digging progresses. Soil from the second spit is dug over on to the enriched subsoil and a strip of topsoil 1ft. wide and deep is thrown over on to the soil from the second spit. This completes the first 3ft. layer, and the procedure is then repeated. This means that the soil has been dug approximately 3ft. deep, but each layer has been kept in its original order—the correct procedure. The top layers may also be enriched with well-decayed manure or compost, if available. In addition, lime may also be spread about as work progresses.

Method of working plots: To save unnecessary shifting of earth when digging or trenching a wide plot divide it in two or three equal strips (Fig. 5). If the plot is divided in halves, the soil taken from the first trench at the beginning can be put with little difficulty alongside where the open finishing trench of the second half will come. This obviates the laborious task of wheeling soil from the opening trench to the far end of the plot, which is often done.

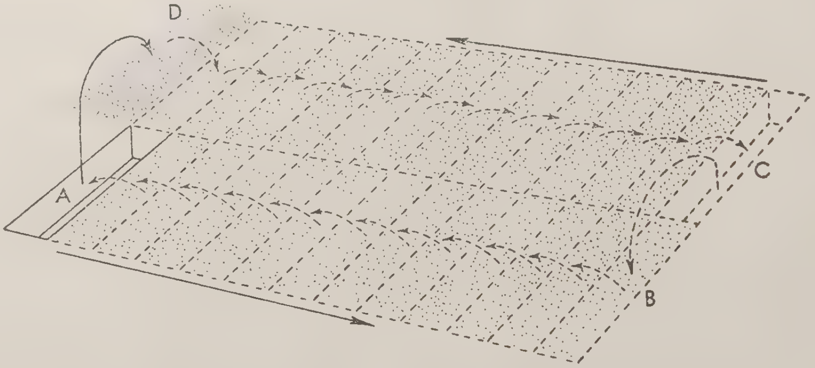


Fig. 5—The plot to be dug over is divided, soil from trench A is placed at D, and digging is continued until soil is removed at B. The soil from C is put into the trench at B and digging continues until the second half of the plot is completed. Finally the soil at D is thrown into the last trench. The two long arrows indicate the direction in which the digger moves backward; other arrows indicate the direction in which soil is thrown.

Ridging of heavier-type soils in autumn is recommended, as the greatest amount of soil surface becomes exposed to the action of the weather, and as a result the soil becomes more friable and is more easily reduced to the desired tilth for early-spring sowings and plantings.

When the soil has been cultivated or ridged an application of carbonate of lime at the rate of 3oz. per square yard will help to correct soil acidity and will provide the calcium necessary for healthy and sustained growth of all vegetables.

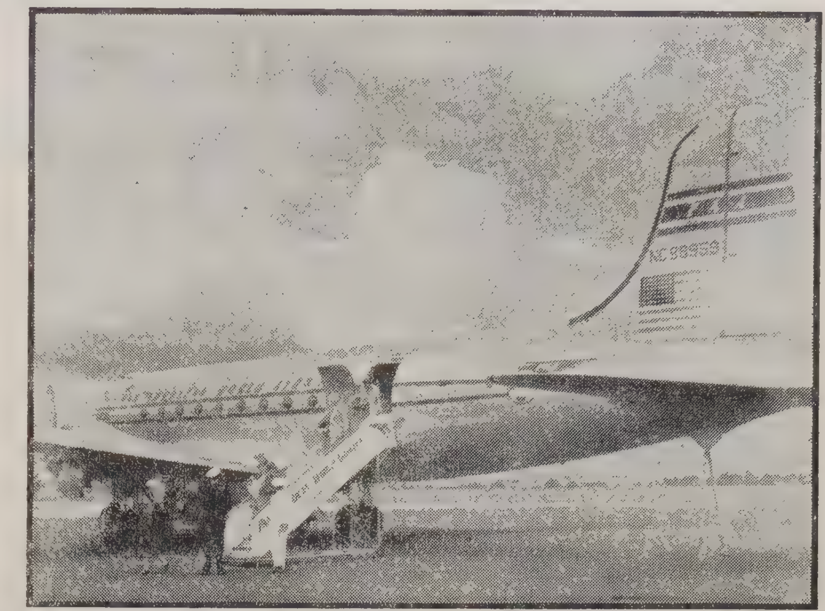
METEOROLOGICAL RECORDS FOR JANUARY

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	65.4	+ 0.3	79.2	45.0	3.91	18		2.15	21	158.0
Auckland	160	67.4	+ 1.0	79.8	52.9	3.21	11	+ 0.10	1.46	22	178.9
Tauranga	10	65.6	+ 1.0	78.8	43.8	8.05	10	+ 3.94	5.29	22	240.3
Ruakura	131	64.1	+ 1.1	82.7	39.1	3.84	9	+ 0.11	1.20	1	220.7
Rotorua	980	63.8	+ 0.9	80.0	42.5	4.64	9	+ 0.26	1.38	22	210.0
Gisborne	12	64.3	— 1.5	82.3	47.4	5.65	15	+ 2.20	1.24	22	173.6
New Plymouth ..	160	63.7	+ 1.0	75.2	47.7	3.01	7	— 1.50	1.63	24	256.4
Napier	5	64.0	— 1.5	77.8	52.7	2.92	12	+ 0.26	1.05	22	165.5
Taihape	2157	60.0	+ 0.8	76.3	41.2	2.52	11	— 0.79	1.22	26	
Wanganui	72	63.8	+ 0.5	83.0	45.0	2.66	9	— 0.23	1.17	21	253.4
Palmerston North	110	63.0	+ 0.4	79.0	44.5	2.89	10	— 0.06	1.84	24	240.6
Waingawa	350	61.1	— 1.3	84.4	34.7	2.36	12	— 0.17	0.53	24	211.4
Wellington ..	415	60.3	— 0.9	77.7	45.5	3.35	10	+ 0.37	1.36	26	229.3
Nelson	24	64.0	+ 1.2	77.9	47.8	3.69	6	+ 0.69	2.06	24	279.1
Blenheim	12	61.4	— 1.8	84.0	42.8	2.23	9	+ 0.49	1.02	23	257.1
Hokitika	12	60.2	+ 2.1	77.1	41.3	3.36	10	— 6 75	1.92	15	278.8
Hanmer Springs ..	1225	57.8	— 2.1	88.0	37.3	5.20	14	+ 1.53	1.48	6	178.6
Christchurch ..	22	59.1	— 2.4	85.4	43.4	4.78	9	+ 2.58	1.44	24	179.1
Ashburton	323	59.0	— 1.6	85.6	41.0	5.25	12	+ 2.68	1.95	24	155.1
Timaru	56	58.8	— 1.9	83.5	42.0	5.17	12	+ 2.79	1.90	24	146.5
Alexandra	520	61.8	+ 0.2	89.4	38.1	2.14	6	+ 0.38	0.90	15	236.4
Taieri	80	57.0	— 0.8	80.8	36.8	3.33	13	+ 0.81	1.46	15	180.2
Invercargill ..	32	56.5	— 0.4	79.0	35.0	2.10	10	— 1.94	1.32	15	167.3

Diseases Transmitted from Animals to Man

By I. G. WATT, Veterinarian,
Department of Agriculture,
Auckland.

AT least 80 diseases of animals can be transmitted to man; some produce grave and disabling ailments which may end in the death of the affected person. Because in any nation a healthy human population depends to such an extent on the health of its livestock, a constant fight to prevent the onset of epizootics, as epidemics of animal diseases are called, is being waged by veterinary officers; it is identical with the campaign undertaken by medical officers of health in the human field.



[*National Publicity Studios photo.*

The rapid expansion in air transport has increased the risk of introduction of animal diseases into New Zealand.

NEW ZEALAND is very fortunate in having up to the present very few serious animal maladies which can infect humans. Two such diseases, both of which are regarded overseas as extremely important, especially in the U.S.A., do occur here; these are bovine tuberculosis and brucellosis, commonly known as contagious abortion of cattle, the organism of which causes undulant fever in humans.

This article, the second part of which will appear in next month's "Journal", discusses briefly several communicable diseases at present in New Zealand and some of those not yet diagnosed here, but which might at any time strike at the livestock industry and at human lives in this country.

In all civilised countries the protection of society against infections transmissible from animals to man is a recognised function of government and part of the national health programme.

In New Zealand control of animal disease is vested in the Department of Agriculture through the Veterinarians, Inspectors of Stock, and Meat Inspectors, and it requires the full co-operation of all owners of animals.

Close liaison is maintained with the Department of Health so that clean, healthy food is available from the paddock to the consumer and so that when any case of disease of animal origin is diagnosed in a human the source of the infection can be traced. Similarly, when dangerous organisms are found in milk and meat products, investigation can be made to eliminate future contamination.

Contact is also maintained with the Customs Department to control import of animals and to prevent smuggling of potentially dangerous animals and with the Department of Internal Affairs, which deals with applications to import birds and animals other than stock.

Of the long list of serious diseases which could be discussed New Zealand has very few at present. Among those which have been diagnosed in animals in this country are bovine tuberculosis, avian tuberculosis, brucellosis in cattle, anthrax, hydatids, salmonellosis, and actinomycosis. There are also less serious diseases such as cow pox and ringworm, which, though annoying, do not produce lasting ill effects.

Complacent Attitude

A somewhat complacent attitude has been adopted toward animal diseases by most New Zealanders. So far, because of New Zealand's isolated position and the stringent regulations governing importation of animals, major plagues of stock have been kept out.

With the advent of air transport New Zealand is no longer safe from diseases which could ruin our livestock industry and wreck our economy, or from dangerous diseases which could be introduced and transmitted to a susceptible human population.

By prohibiting import of dogs from all countries except Great Britain and from parts of Australia, rabies, among other diseases, has been kept out; similarly, New Zealand has been kept free from psittacosis, the so-called parrot fever, by prohibition of traffic in parrots. Both are dangerous human diseases.

Import restrictions are necessary to protect both the animal and human population.

In considering the various diseases which should be of interest to farm and town dwellers, only a brief description of symptoms will be given where necessary, and emphasis will be placed rather on the method of transmission and danger to human life.

Tuberculosis

Tuberculosis has been known since early times. The bones of Egyptian mummies have shown that the disease was present in the 13th century B.C. Mosaic law prohibited the eating of flesh from animals suffering from "wen or scurvey", that is, tuberculosis, and right through the ages laws have been enacted in Europe to control the use of tuberculous meat. There are three types of tuberculosis, the human, bovine, and avian strains, all of which attack man. There is also a form which attacks only fish and other cold-blooded life forms. Of these the reservoir of the human type is man, though animals may be infected; the bovine type affects practically all animals, as well as birds and man; the avian strain is adapted especially for growth at the higher body temperature of birds. It affects all birds and will also attack cattle, pigs, and man.

Tuberculosis is one of the penalties of civilisation. Close contact, whether in human daily life, with animals on the farm or in zoos, or with birds in aviaries, assists in spreading the disease; in the wild state animals or birds are rarely attacked.

Man is much more susceptible to the human strain of tubercle bacillus than to the bovine or avian strain. Cattle, strangely, are fairly resistant to the human strain. Adult humans are much more resistant to bovine tuberculosis than are children.

Milk

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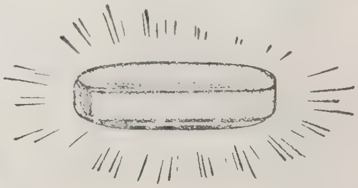

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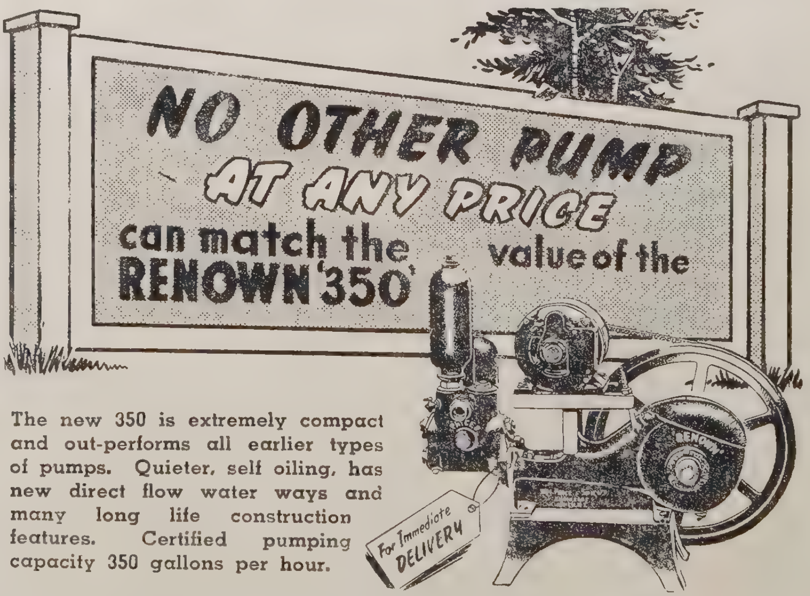

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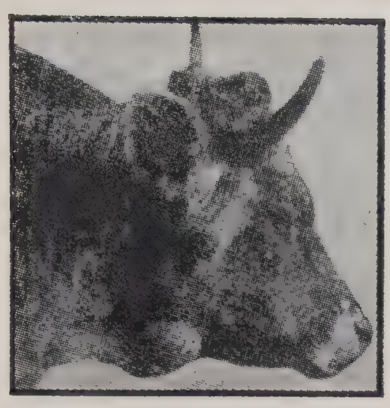


[*After Hutrya, Marek, and Manninger.*
Obvious swellings in the lymph glands of the head and throat of a tuberculous cow.

related to the amount of **raw** milk consumed, although the incidence of bovine tuberculosis in cattle supplying the milk is an important factor. In other words, children are generally infected with the bovine strain, which attacks the bones and joints as well as the lymph glands of the throat and intestines, by drinking infected raw milk. Similarly, cats and dogs are readily infected by drinking tuberculous milk, although they are infected by the human strain also. Milk may be infected with tubercle bacilli either from a tuberculous udder, which is exceedingly difficult to detect in the early stages except by the tuberculin test, or by contamination with droppings or sputum of an animal infected in the lungs. Sputum containing tubercle bacilli is generally swallowed, so that the organisms pass out in the dung, but droplets of saliva may also contaminate the milk.

A cow might reasonably be suspected of having a tuberculous udder if there has been a slowly progressive enlargement of one quarter with no history of active mastitis and no sign of alteration in the appearance of the milk until a late stage. Most swellings of the udder are due to ordinary mastitis and have all the symptoms of inflammation.

The most effective method of preventing the spread of bovine tuberculosis to children through infected milk is by correctly pasteurising the milk.

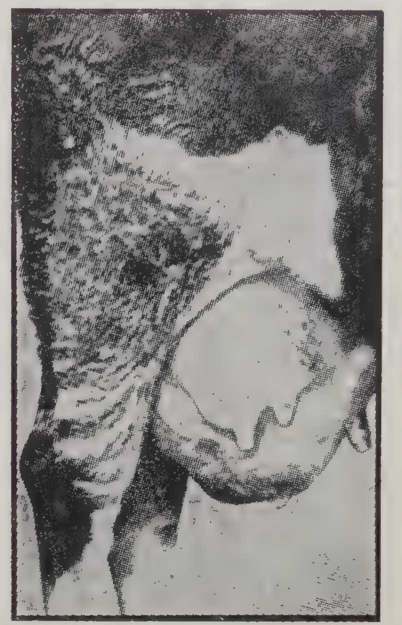
This is cheap and effective and does not interfere greatly with the nutritive properties of the milk. Pasteurised milk, especially that bottled under hygienic conditions, is safe, but all milk, pasteurised or raw, must be handled with the utmost care to avoid contamination after pasteurisation by human "carriers" of many milk-borne diseases such as septic sore throats, scarlet fever, and diphtheria.

Contrary to much expressed opinion, reliable investigation shows that small living doses of bovine tubercle bacilli taken with food do not raise the specific resistance of individuals without producing the disease, although this matter is still under investigation.

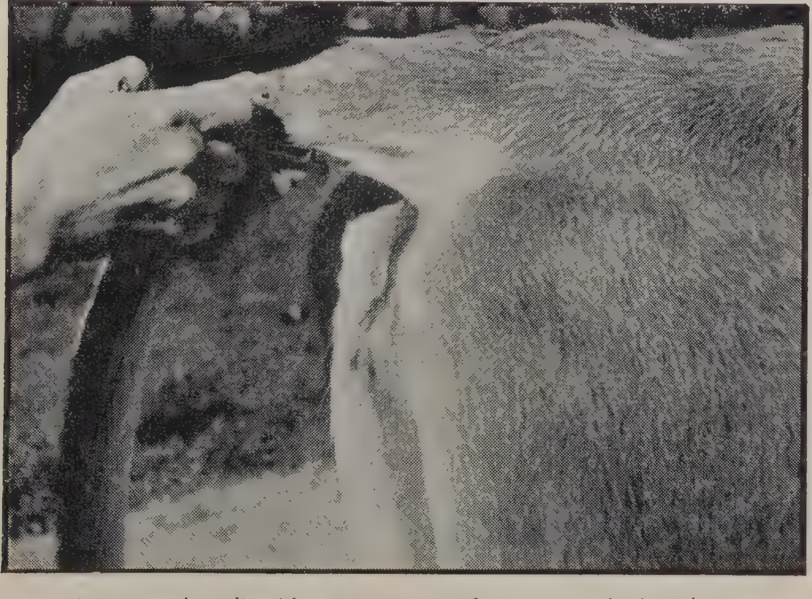
These remarks indicate that milk properly pasteurised and handled, as supplied in the cities, is safest. When house milk is taken from a herd to be used raw it is always safer to fill the jug from the vat of mixed milk than to take it continually from the same cow, because this reduces the chance of obtaining a massive dose of tuberculosis organisms if the chosen cow is infected. Where only one house cow is kept and the milk is used for young children the cow should be tuberculin tested if possible.

Meat

Muscle meat, that is, the ordinary meat eaten, is rarely infected with tuberculosis, although the lymph glands associated with the muscles may contain tubercle bacilli. Carcasses of animals may safely be used for food unless there are signs that tuberculosis is active and widespread throughout the body. Tuberculous lesions very frequently are walled off in glands and the rest of the carcass is quite normal. Cooking is an additional safeguard, so that the eating of meat is not a common cause of tuberculosis. Town dogs and cats which eat butcher's meat are safe from infection from that source.



[*After Hutrya, Marek, and Manninger.*
A very advanced case of tuberculosis in the udder.



Injecting tuberculin with a syringe to test for presence of tuberculosis.

Avian Strain

The avian strain of tuberculosis rarely affects man, though it can affect cattle, pigs, and horses. There is probably some natural immunity in humans, and usually poultry meat and eggs are not eaten raw. A case did occur in New Zealand in 1946, but evidence did not show how it was contracted.

Preventing Transference of Bovine Tuberculosis

There are three methods which can be adopted to prevent the passage of bovine tuberculosis from animals to man:—

1. Attempted eradication of tuberculosis in cattle.
2. Careful supervision of the food supply through inspection of meat and pasteurising of dairy products.
3. Immunisation of susceptible people.

The second method is the one adopted up to the present in New Zealand. Fortunately, the incidence of bovine tuberculosis in this country is not unduly high by world standards, although in some intensive dairying areas it may run between 40 and 80 per cent.; in many places it is extremely low.

Method three involves immunisation of susceptible persons who show a

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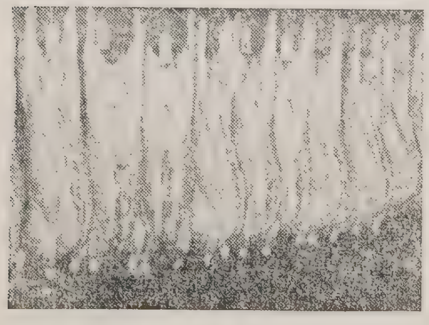

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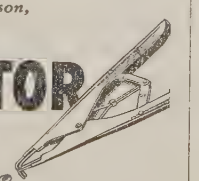

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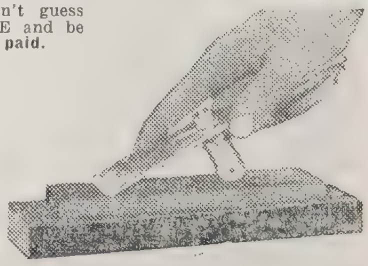

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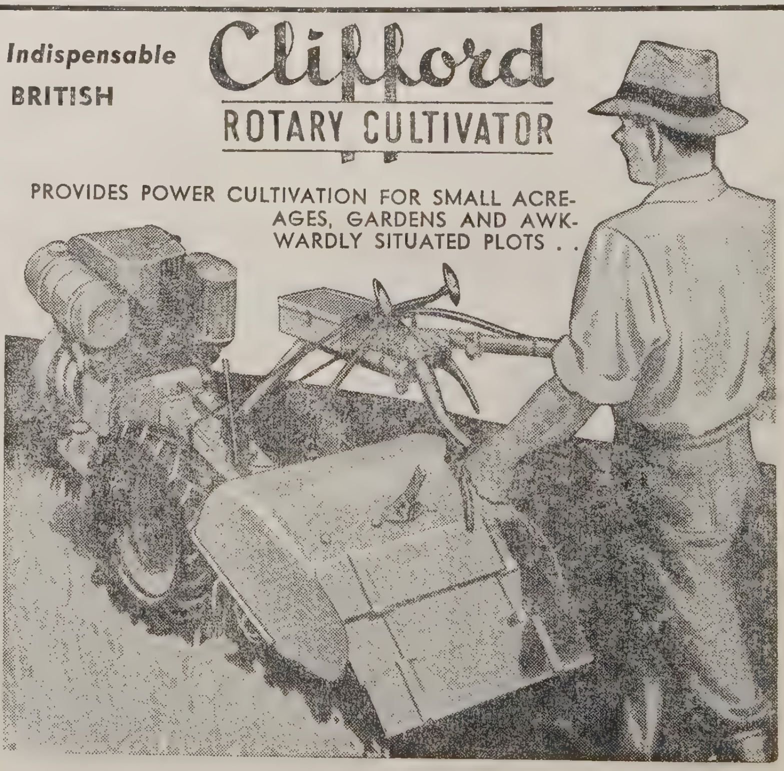

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negative reaction to the tuberculin (Mantoux) test. The vaccine used, known as B.C.G., was first developed in 1908. Results from its use varied, but it was reported to be very effective in Scandinavia and Europe. B.C.G. vaccine is being tried on a limited scale in New Zealand on humans.

Pets

The possibility of infected dogs and cats passing the disease to human contacts must be considered, and although tuberculosis is not very common in dogs, pulmonary tuberculosis can occur and shows as a persistent cough and bloody nasal discharge; the animal also shows laboured breathing, and sometimes when tuberculosis affects the internal organs the dog becomes emaciated. Tuberculosis of small animals is generally a slowly developing chronic disease and must not be confused with the rapid onset of distemper.

[*News-photo Service photo.*

Pasteurisation and bottling of milk under hygienic conditions are safeguards against milk-borne diseases.

Brucellosis

Brucellosis in man is known as undulant fever. Another and older name is Malta fever, which was first diagnosed on Malta in patients affected through drinking goat's milk. There are three types of *Brucella* organisms: *Brucella melitensis*, affecting goats; *Brucella suis* of pigs; and *Brucella abortus*, the cause of contagious abortion in cattle. *Brucella melitensis* and *Brucella suis* are not known in New Zealand. *Brucella abortus* is, however, very common. Cattle are affected with *Brucella* organisms by mouth through eating contaminated pasture. Once they have "slipped", and generally they will "slip" only once, they are always a potential source of infection to other susceptible cattle, particularly young stock.

Subcutaneous inoculation of calf against brucellosis.

Transmission to Humans

The danger to the human population arises from the fact that the organisms leave the non-pregnant uterus and migrate to other sites in the cow's body, the udder tissue often being infected with a small local lesion. This lesion, though producing an immunity in the cow to further infection, reinfects the uterus to a less extent at each subsequent pregnancy and may at any time secrete organisms with the milk.

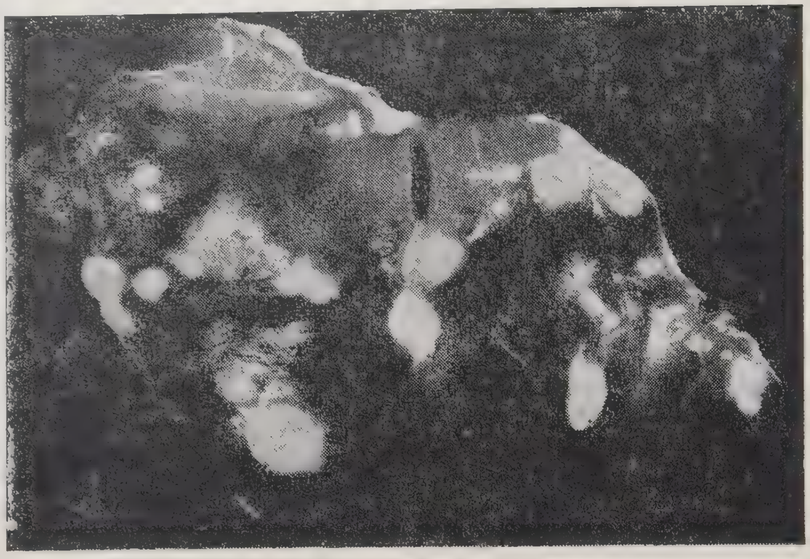
The 1947-49 Year Book shows that during 1047, 32 cases of undulant fever were reported in New Zealand. However, according to American investigators there are far more unreported cases of *Brucella* infection than are diagnosed as undulant fever. One report attributes many backaches and other chronic ailments to *Brucella abortus;* certainly *Brucella* organisms have been recovered from apparently normal portions of human anatomy. Unfortunately, in man the agglutination test done on a blood sample taken from a suspected case is far less reliable than in cattle.

Methods of Control

It is physically impossible, because of the numbers of cattle involved, to eliminate all infected cows from every herd in New Zealand, and all infected cows are not necessarily dangerous. Two methods of control are adopted.

The first is voluntary vaccination of young heifers, which is being done increasingly each year as farmers become aware of the advantages. Vaccination is done with a special attenuated or weakened strain of living organisms and protects the female through the first two pregnancies in most cases. By that time the animal should have acquired a natural immunity. Immunising of young stock should gradually reduce the extent of brucellosis in cattle.

The direct method of controlling the infection of humans with brucellosis is to use pasteurised milk, as pasteurising will kill all *Brucella abortus* organisms. Earlier it was mentioned that house milk should be taken from the vats rather than from individual cows; naturally, care should be taken to see that the milk is saved while cows which have not been known to have slipped are being milked. House cows should always be free from brucellosis and they can be checked readily by taking a blood sample from the tail and sending it to a laboratory for testing. Any officer of the Livestock Division or club veterinarian will assist in this respect; tests can also be done on milk samples.



Hydatids in a liver.

Fortunately there seems to be a varying degree of virulence among different strains of *Brucella abortus*, so that some degree of chance operates in determining how infective a particular strain might be when ingested. Brucellosis in humans can also be an occupational disease in persons handling animals or carcasses. The disease is relatively unknown in purely urban areas where pasteurised milk and butter and cooked meats are the only animal products handled.

Hydatids

In the second section of this article the dreaded disease rabies, which is spread by dogs and other carnivorous animals, will be discussed, but as much to be dreaded, especially by parents with young children, is the tiny dog tapeworm *Taenia echinococcus*; though only ¼in. long, this tapeworm is responsible for much human suffering and enormous economic loss to the meat industry, as it causes hydatid disease.

[*National Publicity Studios photo.*

All hydatid infections arise from dogs which have access to raw sheep offal. Regular dosing of dogs with arecoline will break the life cycle of the hydatid parasite; preventing dogs from eating infected livers and lungs of slaughtered animals will eliminate reinfection.

Much has been written and said about the menace of hydatids, but New Zealand still has one of the worst incidences of hydatids in the world. Hydatid disease is spread by tapeworm eggs in the droppings of dogs. These eggs are eaten by sheep, cattle, or man, and in this host the eggs develop to the bladder worm stage. Dogs are infected by eating raw sheep's offal containing hydatid cysts.

Farmers should realise that by feeding raw offal not only are they breaking the law, but perhaps are condemning their own children to a lingering death. The livers lost, too, can ill be spared today.

Control of hydatids is straightforward, but not spectacular for rapid results. Do not feed raw offal (livers, intestines, etc.) to dogs. Treat dogs with the pills provided, tie them up for half an hour, and bury the material passed by the dogs.

Train children to wash their hands after playing with dogs and always, as should be the practice with adults, before eating. Bury dead sheep before the dogs find them.

(To be continued.)

PREVENTION OF HYDATIDS

Steps which should be taken to control hydatids are dealt with in the Department of Agriculture Bulletin No. 278, "Prevention of Hydatids". It discusses how hydatid disease is spread and its occurrence in man and animals. There is detailed reference to the administering of arecoline to dogs. Copies of the bulletin are available free from the nearest office of the Department of Agriculture.

Ericas are Valuable Shrubs in the Flower Garden

THE planting season will soon be here again, and as New Zealand nurserymen prefer to receive orders for plants as soon as possible, the flower gardener should now be considering his requirements for the season. The genus *Erica* includes many extremely valuable small and intermediate shrubs suitable for cultivation in the home garden, and in this month's article for the flower gardener C. K. Ellis, Horticulturist, Department of Agriculture, Dunedin, describes some of the better-known species and varieties.

THE genus *Erica* consists of bell heathers and heaths and comprises about 500 species, a large number of which are not amenable to cultivation in some of the less favourable inland climates of New Zealand. However, when established most species and varieties are hardy in the North Island and throughout the coastal and semi-coastal regions of the South Island.

A light, sandy type of loam with a high content of humus in the form of peat or leaf mould and of a slightly acid nature suits most ericas best, though a few will thrive in alkaline soils; *Erica carnea*, for example, is completely indifferent to the presence of lime. Most ericas benefit from pruning immediately after flowering.

The species are easily propagated by seed sown during July or August in a light soil with plenty of leaf mould or peat and left completely exposed to the elements. The varieties can be increased only vegetatively, and cuttings seem the most successful and the easiest method.

Cuttings little more than 1in. long are taken during December and January and inserted in a cold frame or under a bell jar. The cuttings should be taken from side growths and to avoid damaging the bark care should be taken when removing the bottom leaves. Sandy-peat soil is the best rooting medium and the cuttings will root more readily if the soil for the mixture is gathered from beneath established erica bushes; this soil contains myccorhizal fungi, better known as beneficial root fungi.

Ericas which Thrive in New Zealand

The following list, though far from complete, includes some of the species and varieties which thrive in New Zealand.

Erica arborea, a native of the Mediterranean countries, grows up to 10ft. high, has hairy stems, smooth greyish leaves, and bears large clusters of fragrant white flowers in September and October.

[Green and Hahn Photography Ltd. photo.

Erica australis, from Spain, is a strong but straggly bush growing up to 5ft. high and covering itself during October with purple-rose flowers.

Erica carnea produces flesh-coloured flowers. It is a native of central and southern Europe and its branches are usually prostrate or semi-prostrate, its leaves are smooth and green, and its flowers are borne in clusters about 2in. long from June to September. It seldom grows to more than 1ft. high. *Erica carnea* has many varieties, of which the following are recommended:—

Erica carnea var. *atrorubra* is late flowering and has crimson flowers on dark-green foliage.

Erica carnea var. C. J. Backhouse has creamy-white flowers.

Erica carnea var. Mrs. Doncaster has flowers of clear pink and flowers early.

Erica carnea var. Queen Mary has deep-pink flowers.

Erica carnea var. Ruby Glow is a late-flowering variety with flowers of carmine paling to pink as they fade.

Erica carnea var. Springwood White is of prostrate habit, and has white flowers.

Erica carnea var. Springwood Pink is of prostrate habit and has flowers of pink.

Erica carnea var. Winter Beauty has deep-pink flowers.

Erica ciliaris comes from western Europe and its leaves are fringed with hairs. Its flowers are inverted, bell shaped, rose red, and are freely produced in 5in.-long sprays. It prefers a soil free of lime and grows up to 2ft. high. It has three well-known varieties, *alba*, with white flowers, *globosa*, with pink flowers, and *maweana*, with crimson flowers.

Erica cinerea is the scotch or twisted heath of north-west Europe, which reaches 18in. high and has very small dark-green leaves. It bears large purple flowers and the species with its varieties is capable of producing bloom from December until April. Some of the varieties are:—

Erica cinerea var. *alba minor* has white flowers and is a valuable plant for the rock garden; it never grows more than 6in. high.

Erica cinerea var. *atrosanguinea* has freely produced, dark-red flowers.

Erica cinerea var. *carnea* is of semi-prostrate growth and has large, pale-pink flowers.

Erica cinerea var. *coccinea* is of dwarf growth and has dark foliage and flowers of bright red.

Erica cinerea var. *licana* has flowers of lilac colour.

Erica cinerea var. Mr. Dill is of dwarf, spreading habit and has clear pink flowers.

Erica cinerea var. *purpurea* has deep-green foliage and dark-red flowers.

Erica cinerea var. Rose Queen has a close-growing habit and a mass of rose-pink flowers.

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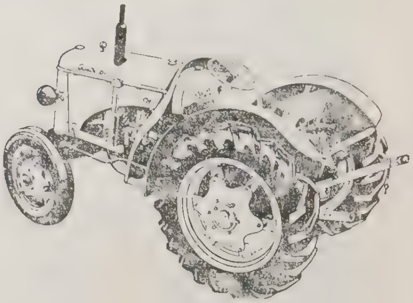

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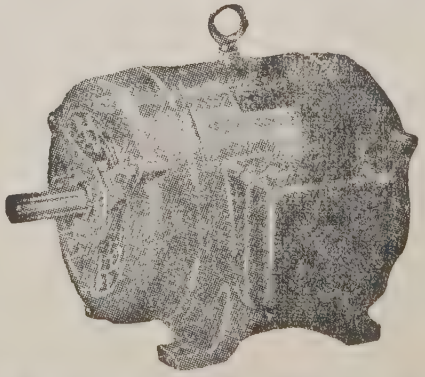

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[*Douglas Elliott photo.*

Erica hybrida variety Dawn.

Erica hybrida var. H. Maxwell is one of a group of garden hybrids, is of vigorous growth, and bears sprays of large rose-red flowers.

Erica mackayi, of Spain, sometimes known as *E. tetralix* var. *mackayi*, is a dwarf type with hairy foliage and clusters of pink flowers produced during January and February.

Erica mediterranea, a native of south-west France, forms a bush up to 8ft. high and clothes itself from September until early December with small rise-pink flowers.

Erica mediterranea var. Brightness is a hybrid with dwarf characteristics and rose-red flowers.

Erica pageana, from South Africa, is an unusual and most attractive heath with large, waxy, deep-yellow flowers. It grows up to about 5ft. high.

Erica tetralix var. *rubra* is a dwarf type seldom growing more than 18in. high and bearing clusters of dark-red flowers from November until March.

Erica veitchi is a garden hybrid between *E. ciliaris* and *E. tetralix;* it grows up to 1ft. high and from December to February produces a profusion of rose-coloured flowers.

[*Douglas Elliott photo.*

Pot-grown tuberous begonias should now be dried off gradually by being given less and less water until leaves and stems turn yellow and dry off.

Garden Work for April

Begonias in pots should be dried off gradually by giving them less and less water until the leaves and stems turn yellow. When the plants are quite dormant the pots should be put in a dry, frost-proof place. Fibrous-rooted begonias should be lifted from the borders when autumn frosts cause growth to cease for the year, set closely in boxes, and stood in a sheltered, frost-free place for the winter. The plants can be started into growth next spring and new plants propagated from cuttings.

Bulbs that have been potted up in bowls and stood out in a cool, dark place to root should be cleaned up and taken into the house as soon as shoots appear above the soil. They should be put in a cool room at first and watered sparingly. If bowls of bulbs are not given this period of rooting at a low temperature, the leaves start to grow before there is an adequate rooting system to support them and the flowers are not as fine as they should be.

Bulb planting should be finished in April except in the warm northern districts, where tulips are better kept in a cool place until May before being planted out. There is no point in keeping bulbs out of the ground longer than necessary, as they shrivel and deteriorate, and bulbs not planted at the proper time cannot be held over until the following season like many sorts of seeds.

Disbudding of chrysanthemums should be continued as the flower buds develop. Though stems with a single bloom are usually considered best for cutting, there is no need to take off too many buds from plants grown solely for border display. However, it pays to remove a proportion of buds even from border chrysanthemums, especially the buds growing from the stem below the main flower cluster, and also to remove side shoots growing from lower down the stems. That involves a certain amount of trouble, but much improves the appearance of the plants when in flower. Chrysanthemums not yet fully staked should be supported at once, as the stems rapidly become top heavy when the flower buds swell. In districts liable to heavy frosts the late varieties of chrysanthemums can now be wrenched, lifted, and carefully replanted in a glasshouse or in a sunny, sheltered place where the blooms can be protected from frosts. Plants

[*Photo News Ltd. photo.*

To obtain the best blooms the disbudding of chrysanthemums should be continued as the flower buds develop.

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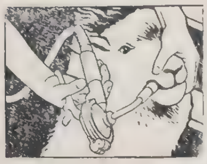

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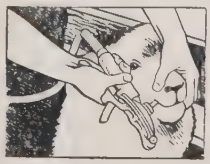

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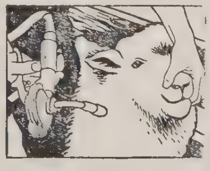

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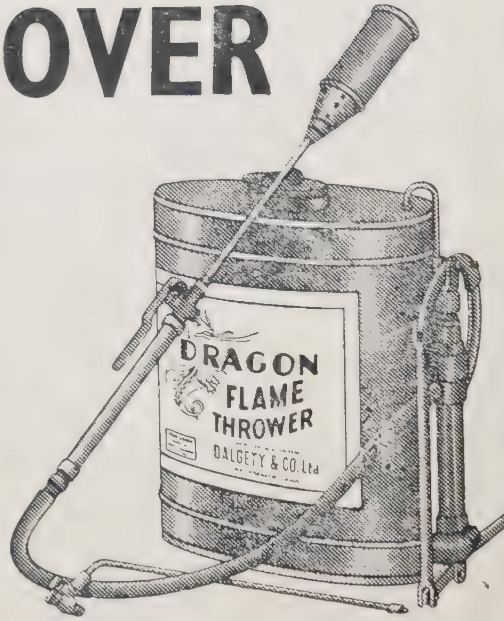

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Cydonia japonica

WELL known to most gardeners as the flowering quince or japonica, *Cydonia japonica* is a hardy deciduous flowering shrub of spreading habit growing from 4 to 8ft. high. Apart from lending beauty to the garden, it is very accommodating about situation, thriving in any well-drained soil either in an open border or against a wall, though it prefers warm, sunny positions.

There are many varieties with large flowers ranging from white to shades of pink, red, and scarlet which are borne from July to December. Bright green, oval foliage develops shortly after the first flowers open, adding a fitting background to the brilliant show of blossom. In some instances decorative fruits follow the flowers, and these are said to make excellent jelly.

Pruning of shrubs which are wall trained consists of cutting out any very old or weak growths after the plants have flowered and shortening back all side shoots. Some strong new growths may be needed to replace those cut out. Bush specimens are treated similarly.

These shrubs can be propagated readily by 9in. cuttings of ripened wood planted outdoors in March or April. Layering and the removal of sucker growth are other methods of establishing young plants.

—*H. P. THOMAS, Vegetable Instructor,*
Department of Agriculture, Wanganui.

should not be packed too tightly together or the leaves will be attacked by chrysanthemum mildew. Chrysanthemums growing in pots should be fed regularly with liquid manure.

Dahlia roots are tender and are killed by hard frost. In cold districts where the ground is likely to freeze hard in winter dahlias should be cut down to about 6in. above the ground before the first hard frost is likely and after the plants have finished flowering. Labels should then be tied to the bases of the stems to identify the varieties, and the tubers should be lifted carefully with a spade and set aside in an airy, frost-free place to dry. When dry the roots should be stored for the winter in a cool shed where they will be safe from frost. In most districts in New Zealand the roots can be safely left in the ground for the winter, but the practice of lifting and storing them leaves the ground clear for digging over in winter and avoids the risk of losing the roots in winters which are exceptionally severe for the district.

Fuchsias growing in pots are usually dried off at this time of year, though the soil in the pots should not be allowed to become completely dry. If desired, pot fuchsias can be kept growing all through the winter on a sunny windowsill, and often they will bear flower buds, though these usually fall off before they open. The plants should be kept drier than during summer and autumn and pruned back hard in spring to start them into growth again and to prevent them from becoming too large for use in the house.

Gladioli should be lifted and dried off when the leaves show an obvious change of colour, and plants lifted earlier and now dried off can be prepared for storage by cutting off the leaves about 1in. above the corms and rubbing off the old shrivelled corm. The skins should not be removed until spring, as corms keep better in store with their skins in place. Seedlings sown last month should be kept growing strongly until each has two leaves, after which they should be watered less and less and gradually dried off.

Herbaceous perennials which have finished flowering should be cut down to within a few inches of the ground, the stubs being left to mark the positions of the roots. Plants which have been in for several years and need dividing can be lifted now, the ground dug over, and well-rooted pieces of the plants replanted. Gaps in the border can also be planted up now by making proper use of the perennial scabious, pyrethrums, delphiniums, aquilegias, and perennial phlox, all of which are worth a place in every mixed border and do not spread unduly.

Cuttings from the frame should be planted out as they root and also Iceland poppies and other seedlings from the boxes in which they have been grown. Sturdy antirrhinum seedlings growing in the borders can be transplanted to fill up gaps, and all pansy, viola, Canterbury bell, gaillardia, and hollyhock plants still growing in the frame or nursery bed should be planted into the borders to flower next year.

Pot plants growing in the house should be washed by being held upside down under a cold-water tap. This washes off pests such as red spiders, thrips, and aphides and freshens up the plants. Leaves which show small, whitish dots on their upper surfaces or become rusty coloured indicate that red spiders are feeding on the undersides. The red spiders can be seen with the naked eye, often moving beneath a thin webbing. Pot plants still growing strongly should be fed regularly with liquid manure or a complete fertiliser of a suitable grade.

Geraniums and balsams which have grown too big to be accommodated on windowsills should be pruned hard, the old leggy growths being removed; new shoots will soon grow from the bases of the plants. If plants are grown in a window where blinds are drawn at night, it is worth while to have the window ledge widened by the addition of a strip of wood so that the pot plants can stand well away from the window and the blinds do not touch

Fuchsias growing in pots are usually dried off at this time of year, though the soil in the pots should not be allowed to become completely dry.

the pots when pulled down. If blinds or fringes come in contact with the pots, they absorb moisture that may stain the fabric and leave marks that are hard to remove.

Shrubs which are to be moved and which were partly wrenched last month should now be further prepared by wrenching the remainder; that is, digging should be continued around the rest of the shrub and the remaining roots severed some distance from the trunk. The shrubs, which should not be moved for a further 6 or 8 weeks after being wrenched, will have little anchorage and should be supported with strong stakes to prevent them from being blown over.

Stakes can be preserved by dipping them in a proprietary wood preservative. Another very satisfactory way of lengthening the life of manuka stakes is to dip them in creosote and then to plunge the butts into hot tar to the depth to which they will be embedded in the ground. Stakes treated this way last for up to 8 years if well stacked off the ground when not in use.

Thinning of annuals sown earlier should be continued and annuals and bedding plants which have finished flowering should be pulled out.

Flower heads which are faded and dead should be taken off regularly.

Hydrangeas in relatively mild districts should be pruned if that work has not already been done.

Plants to Propagate this Month

Buds inserted earlier should now be established. The ties should be cut before the swelling stems cause them to bite into the bark.

Cuttings of many perennial plants such as geraniums, hybrid wallflowers, catmint, and marguerites will still root if put in cold frames. Viola cuttings may also be taken, but only young, strong shoots should be used. This is the season to start taking hard-wood cuttings of shrubs, each 6 to 10in. long; the lower leaves of cuttings of evergreen species should be removed. Among the many shrubs easy to propagate in this way are *Lonicera nitida*, escallonia, privet, and flowering currant. (A hard-wood cutting is one in which the whole stem is woody to the tip.) The cuttings should be inserted firmly in the soil with about half their lengths buried.

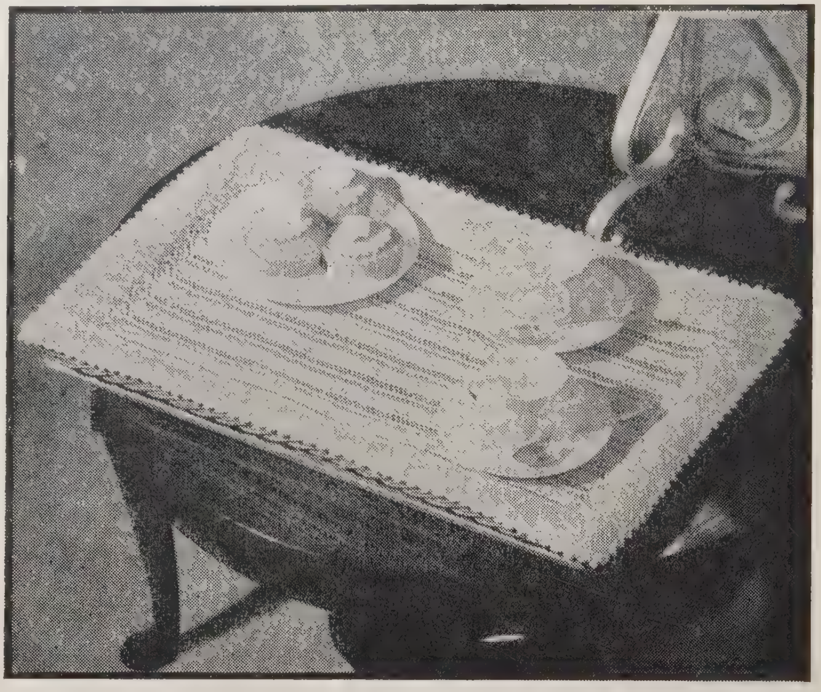
Lift, divide, and replant pinks, double daisies, and herbaceous perennials which have finished flowering.

Plant out cinerarias (in a semi-shady place), Iceland poppies, forget-me-nots, wallflowers, and other bedding plants that will make a showy display in spring. To give the new plants the benefit of the warmth still in the soil, planting should be done as soon as the summer bedding plants and annuals have been removed. If planting is delayed unnecessarily, the plants have less chance to become well established before the cold weather sets in.

Sow a further batch of annuals for early flowering in the warm northern districts where most of the hardy annuals will grow steadily all through the winter.

◆

TRAY CLOTH IN FAGGOT PATTERN



THE tray cloth in faggot pattern illustrated is made from two 2oz. reels of knitting cotton equal to No. 16 or No. 18. It is 20in. by 13in. and is made on two No. 14 knitting needles with the tension at about 9 stitches to 1in.

Abbreviations: K., knit; p., purl; st., stitch(es); tog., together; m. st., moss st.; st. st., stocking st.; rep., repeat; cont., continue; patt., pattern; sl., slip; p.s.s.o., pass slip st. over; beg., beginning; m., make.

Cast on 111 st. and work in m. st. First row: K. 1, * p. 1, K. 1. Rep. from * to end. Rep. this row until work measures 1½in.

Now work in patt. with m. st. border of 14 st. at both ends of every row. ** First row: (K. 1, p. 1) 7 times, k. 2, * m. 1, sl. 1, k. 1, p.s.s.o., k. 5, k. 2 tog., m. 1, k. 1. Rep. from * to last 15 st., k. 1, (p. 1, k. 1) 7 times. Second row: (K. 1, p. 1) 7 times, p. 3, * m. 1, p. 2 tog., p. 3, p. 2 tog., m. 1, p. 3. Rep. from * to last 14 st., (p. 1, k. 1) 7 times. Third row: (K. 1, p. 1) 7 times, k. 4, * m. 1, sl. 1, k. 1, p.s.s.o., k. 1, k. 2 tog., m. 1, k. 5. Rep. from * to last 23 st., m. 1, sl. 1, k. 1, p.s.s.o., k. 1, k. 2 tog., m. 1, k. 4, (p. 1, k. 1) 7 times. Fourth row: (K. 1, p. 1) 7 times. p. 5, * m. 1, p. 3 tog., m. 1, p. 7. Rep. from * to last 22 st., m. 1, p. 3 tog., m. 1, p. 5 (p. 1 k. 1) 7 times. Fifth row: (K. 1, p. 1) 7 times, k. 1, k. 2 tog., * m. 1, k. 7, m. 1, sl. 1, k. 2 tog., p.s.s.o. Rep. from * to last 24 st., m. 1, k. 7, m. 1, sl. 1, k. 1, p.s.s.o., k. 1, (p. 1, k. 1) 7 times. Sixth row: (K. 1, p. 1) 7 times, p. 4, * p. 2 tog., m. 1, p. 1, m. 1, p. 2 tog., p. 5. Rep. from * to last 23 st., p. 2 tog., m. 1, p. 1, m. 1, p. 2 tog., p. 4, (p. 1, k. 1) 7 times. Seventh row: (K. 1, p. 1) 7 times, k. 3, * k. 2 tog., m. 1, k. 3, m. 1, sl. 1, k. 1, p.s.s.o, k. 3. Rep. from * to last 14 st., (p. 1, k. 1) 7 times. Eighth row: (K. 1, p. 1) 7 times, p. 2, * p. 2 tog., m. 1, p. 5, m. 1, p. 2 tog., p. 1. Rep. from * to last 15 st., p. 1, (p. 1, k. 1) 7 times.**

Now work in st. st., (1 row k., 1 row p.) with lace patt. panels. First row: (K. 1, p. 1) 7 times. K. 1, k. 2 tog., m. 1, (k. 7, m. 1, sl. 1, k. 2 tog., p.s.s.o., m. 1) 7 times, k. 7, m. 1, k. 2 tog., k. 1, (p. 1, k. 1) 7 times. Second row: (K. 1, p. 1) 7 times, p. 3, m. 1, p. 2 tog., p. 3. (p. 2 tog., m. 1, p. 3, m. 1, p. 2 tog., p. 3) 7 times, p. 2 tog., m. 1, p. 3, (p. 1, k. 1) 7 times. Rep. these 2 rows until work measures 18in., ending with a second patt. row. Now rep. from ** to ** once more. Next row: (K. 1, p. 1) 7 times, k. 1, k. 2 tog., m. 1, (k. 7, m. 1, sl. 1, k. 2 tog., p.s.s.o., m 1) 7 times, k. 7, m. 1, k. 2 tog., k. 1, (p. 1, k. 1) 7 times. Now work in m. st. for 1½in. Cast off.

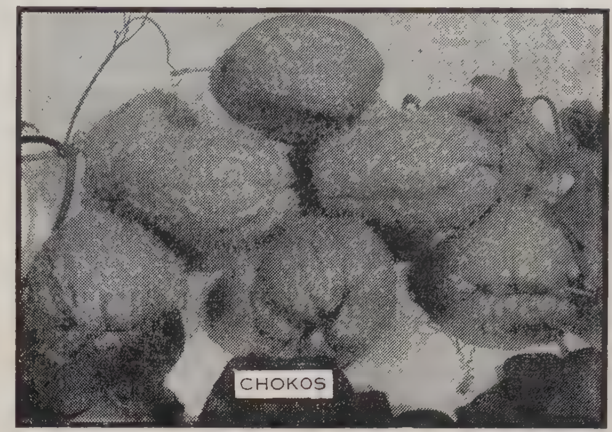
Make up: Work a crochet border round edges thus: 1 single crochet into edge, * 3 chain, 1 double chain into first chain, miss a small space, 1 single crochet into edge. Repeat from * all round. Starch, pin out, and press.

◆

Chokos and Egg Fruits Can Add Variety to Autumn Menus

By EVELYN E. MOORE, Rural Sociologist,
Department of Agriculture, Palmerston North.

EGG plants and chokos are two useful vegetables which are not yet very well known in New Zealand, particularly in the South Island, where, because of their susceptibility to damage from early autumn frosts, they cannot be grown conveniently. In the north, however, they grow prolifically, and chokos especially, once they are established, require little attention. The home gardener confronted with his first big crop of chokos and egg fruits (the edible portion of egg plants) and wondering how best to use them, or the southerner desirous of investing the daily fare with an air of novelty, should find the following recipes useful.



[*Sparrow Industrial Pictures Ltd. photo.*

CHOKOS, particularly, are vegetables which keep well after harvesting, and may be bought with confidence in South Island shops until July or August, after which they begin to sprout.

Egg fruits, which ripen during March and April, are best bought during these months or picked and used as soon as they change to their purple colour, as they become dry and tough with age.

In colour, flavour, and texture chokos most closely resemble marrows, but are firmer and have a delicate almost nutlike flavour. The fruits of egg plants—or aubergines as they are called in England—have a striking, shiny, deep bluish purple skin and a soft, cream-coloured, rather spongy flesh somewhat like the solid white stalk of a mushroom, and like mushrooms they are at their best when freshly picked and fried in butter or baked in a casserole with milk, butter, and seasoning.

Choko Recipes

The following are ways of using chokos:—

Boiled Chokos

Peel the chokos, halve them, and remove the central cores, slice or cube the chokos if desired, and cook them in boiling salted water or a steamer until they are tender (20 to 30 minutes). Chokos may also be cooked in a pressure saucepan (5 to 6 minutes at pressure). Chokos sometimes have very prickly skins; these chokos may be cooked in their skins, which then peel off easily.

Chokos have a delicate flavour and contrast in flavour and colour with vegetables such as tomatoes and spinach or with grilled bacon or cheese sauce. Chokos are not very suitable for baking alone, as they tend to dry out and become tough.

[*Sparrow Industrial Pictures Ltd. photo.*

Scalloped Choko

2 chokos (about 1lb.) cooked
  and cubed
1 cup of cheese sauce
½ cup of buttered breadcrumbs
(Sufficient for 3 or 4 servings)

Place chokos and sauce in alternate layers in a greased pie dish, sprinkle them with the buttered breadcrumbs, and bake the mixture in a moderate oven (350-375 degrees F.) until it is golden brown on top (15 to 20 minutes). Serve with grilled bacon.

Baked Stuffed Chokos

Stuffed choko, which is similar to stuffed baked vegetable marrow, is an attractive savoury for a lunch or tea meal.

Slice chokos in halves lengthwise, core them, and steam or boil them until they are tender. Scoop out the centres, leaving a shell about ½in. thick. Arrange the halves on a baking tray, fill them with savoury vegetable, meat, or cheese mixture, and bake them in a moderate oven (350 degrees F.) for 20 to 30 minutes or until they are golden brown on top.

Two suggestions for stuffings are given below:—

1 cup of mashed choko pulp
1 cup of minced cooked meat
1 minced onion
½ teaspoon of salt
1 egg
A shake of pepper
¼ teaspoon of celery salt
1 cup of breadcrumbs and
  1 tablespoon of butter

Mix the choko pulp, meat, onion, seasoning, and slightly beaten egg together. Fill half shells, sprinkle them with buttered breadcrumbs, and bake them until golden brown.

About ½ cup of mashed choko
  pulp
1 slightly beaten egg
2oz. of grated cheese
1 tablespoon of chopped parsley
¼ teaspoon of salt
A shake of pepper
Sufficient breadcrumbs to make
  the mixture stiff

Pile the mixture into hollowed-out chokos and bake them until the tops are golden brown.

Chokos in Pickles

Chokos may be substituted for melon or cucumber in pickles. Following is a recipe:—

3 large chokos (about 3lb.)
1 small cauliflower (about 1lb.)
1lb. of onions
3½ pints of vinegar
2lb. of brown sugar
1 tablespoon of curry powder
1 tablespoon of mustard
1 tablespoon of turmeric
1 teaspoon of pepper
1 teaspoon of salt
1 cup of flour

Cucumbers or beans may be substituted for cauliflower and chillies may be added if a hotter pickle is desired.

Slice the vegetables finely and add them to 3 pints of vinegar. Bring the vinegar to the boil, add the sugar, and continue boiling the mixture until the vegetables are tender (15 to 20 minutes). Mix the remaining ingredients to a smooth paste with the ½ pint of vinegar and add the paste to the pickles. Simmer the mixture gently for 10 minutes, stirring continuously.

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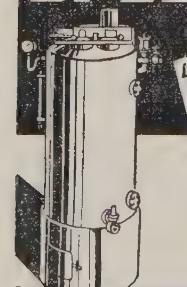

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RECIPES USING CHOKOS AND EGG FRUITS

Stuffed egg fruit and tomato.

Chokos in Jam

Chokos may be substituted for melons in recipes for melon jam, or for marrows in recipes for marrow jam.

Choko and Lemon Jam

- 3lb. of chokos (peeled and sliced)
- 2 large lemons
- 3lb. of sugar
- 1 teaspoon of passion fruit essence

Steam sliced or finely cubed choko, or cook it in a pressure saucepan until it is tender. Add the grated lemon rind, the lemon juice, and the sugar and let these ingredients stand for 24 hours. Next, place them in a pan, heat them carefully until all the sugar is dissolved, and cook them until the choko is transparent and the syrup thick. Stir in the passion fruit essence and bottle the jam.

In place of the passion fruit essence ¼lb. of finely sliced crystallised ginger may be added to the sugar, lemon, and choko before they are cooked.

Egg Fruit Recipes

Egg fruits should be washed before being cooked; if they are to be peeled and sliced, this preparation should be done immediately before they are to be cooked, as they turn brown quickly; soaking fruits in salted water is not recommended.

Because of their delicate flavour, egg fruits are perhaps best appreciated when served as a course or in a luncheon or tea dish rather than as an accompanying vegetable in the main dinner course.

Fried Egg Fruit

Peel the egg fruits and cut them across in ½in. slices. Dip the slices in beaten egg and then in breadcrumbs or a thin batter and fry them in salad oil, margarine, or butter until golden brown on both sides. Drain the slices well before serving them.

Alternatively, dip the slices in seasoned flour and fry them till tender or sandwich two slices with cheese paste, dip them in batter, and fry them in deep fat till golden brown.

Serve them alone or with grilled tomatoes or tomatoes and cheese sauce.

Baked Egg Fruit

Prepare and slice egg fruits. Spread the slices with butter or French dressing (on both sides), place them on a baking tray, and bake them at 400 degrees F. until they are tender (approximately 12 minutes), turning them once. Serve the slices with grilled tomatoes and bacon, sliced lemon, or tomato sauce.

Baked egg fruit may be marinated (pickled) in salad dressing and served cold in salads.

Scalloped Egg Fruit

- 1lb. of egg fruit
- 2 tablespoons of chopped parsley
- 1 onion
- ½ cup of breadcrumbs
- 3 tablespoons of butter
- ½ cup of milk

(Sufficient for 3 or 4 servings)

Peel and dice the egg fruit and boil or steam it until it is tender. Drain the egg fruit and sprinkle it with parsley and minced or sliced onion. Melt the butter and stir in the breadcrumbs. Place a layer of egg fruit in a greased pie dish then a layer of crumbs, and continue with alternate layers until the dish is filled, finishing with a layer of crumbs. Pour on the milk and bake the dish at 375 degrees F. until it is lightly browned (½ hour). Serve with grilled bacon.

Baked Stuffed Egg Fruit

Choose fairly large, well-shaped fruits. Split them in halves lengthwise, score the flesh with a sharp knife, dot it lightly with butter, and sprinkle it with salt and pepper. Place the fruits in a baking dish or shallow casserole, barely cover the bottom of the dish with stock or water, cover the dish, and bake the fruits in a moderate oven until they are just tender (about 25 to 30 minutes). Drain the fruits well, remove the pulp with a spoon or curved grapefruit knife,

Casserole of choko served with grilled bacon.

leaving the shells whole and sufficient pulp to allow the fruits to keep their shape.

Place the shells in a baking dish and stuff them with either of the following mixtures:—

To each ½ cup of egg fruit pulp add:—

4oz. of minced cooked meat
Puree of fresh tomatoes or tomato sauce
½ tablespoon of minced onion
A pinch of salt and pepper

Mix the pulp, meat, and onion thoroughly and season them well. Add sufficient tomato puree (obtained by blanching, peeling, and mincing fresh tomatoes if a juice extractor is not available) or tomato sauce to moisten the mixture and fill the shells with it. Place dabs of butter on the shells and bake them for 15 minutes in a hot oven. Garnish the dish with sliced tomato or chopped parsley.

To each ½ cup of egg fruit pulp add:—

½ cup of thick white sauce
2oz. of grated cheese
2 egg whites
A pinch of salt and pepper

Mix the pulp, sauce, three-quarters of the cheese, and the seasoning. Fold in lightly the stiffly beaten egg white. Pile the mixture into the shells, sprinkle them with the remainder of the cheese, and bake them in a moderate oven until they are well risen and lightly browned. Serve them immediately.

Baked Egg Fruit and Mushrooms

Mushroom-gathering expeditions do not always meet with great success, so the following recipe may be a solution when there are insufficient mushrooms for a meal for the whole family:—

1 cup of cooked, diced, or minced egg fruit
1 tablespoon of chopped or minced onion
1oz. of melted butter or fat
1 teaspoon of chopped parsley
½ cup of finely chopped mushrooms or equal quantities of chopped mushrooms and parsnips
A pinch of nutmeg
A pinch of salt and pepper

Fry the chopped onion, mushroom, and parsnip together in the butter or fat until they are lightly browned. Season them with salt and pepper, add the nutmeg and parsley, and add the whole to the cooked egg fruit, mixing all the ingredients thoroughly. Tip the mixture into a greased pie dish, sprinkle it with buttered breadcrumbs and grated cheese, brown it in the oven, and serve it hot.

Men's Ribbed Socks

HAND-KNITTED socks are popular with men, and in this article instructions are given for making serviceable socks in a ribbed pattern. Made with 3oz. of 3-ply wool, the socks are knitted on four No. 13 steel needles.

MEASUREMENTS are: Length of leg to top of heel, 10½in.; length of foot, 11in. Tension is 9½ stitches to 1in.

Abbreviations used are: K., knit; p., purl; st., stitch(es); inc., increase; dec., decrease; tog., together; sl., slip; p.s.s.o., pass slipped st. over; cont., continue; rep., repeat; beg., beginning; patt., pattern.

Cast on 72 st. (24, 24, 24) and then work in rounds of k. 1, p. 1 rib for 3in. Cont. in patt. thus: First and second rounds: K. to the end. Third and fourth rounds: K. 1, * p. 2, k. 2. Rep. from * to the last 3 st., p. 2, k. 1. Rep. these 4 rounds until the work measures 6in., finishing at the end of the third needle.

Shaping the Leg

First round: K. 1, k. 2 tog., patt. to the last 3 st., sl. 1, k. 1, p.s.s.o., k. 1. Second round to fifth round: Patt. to the end. Keeping the continuity of the patt., rep. these 5 rounds three times more (64 st.). Now cont. in patt. until the work measures 10½in., finishing at the end of the third needle.

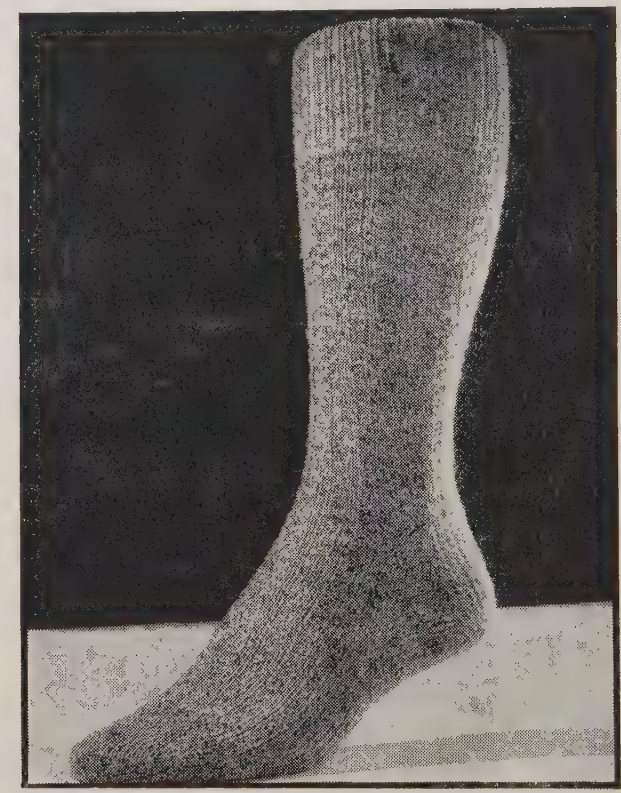
Shaping the Heel

With the wrong side of the work facing one slip the last 16 st. from the end of the third needle on to the first needle; then slip 4 st. from the end of the first needle on to the second needle, thus leaving 32 st. on the first needle for the heel and 32 st. to be arranged on two needles for the instep. Break off the wool and rejoin it at the heel. First row: * Slip 1, k. 1. Rep. from * to the end. Second row: P. to the end. Rep. these two rows 16 times.

Turning the Heel

First row: K. 17, k. 2 tog., turn. Second row: P. 3, p. 2 tog., turn. Third row: K. 4, k. 2 tog., turn. Fourth row: P. 5, p. 2 tog., turn. Fifth row: K. 6, k. 2 tog., turn. Sixth row: P. 7, p. 2 tog., turn. Seventh row: K. 8, k. 2 tog., turn. Eighth row: P. 9, p. 2 tog., turn.

Cont. thus working one extra st. on each row before decreasing, the last 2 being: K. 15, k. 2 tog., turn. Next row: P. 15, p. 2 tog., turn. Next row: K. 16; then on to this same needle pick up and k. 20 st. along the side of the heel flap. With the second needle work in patt. across the 32 instep st. With the third needle pick up and k. 20 st. along the other side of the heel flap; then k. 8 st. from the first needle.



Shaping the Instep

First round: First needle, k. to the end; second needle, patt. to the end; third needle, k. to the end. Second round: First needle, k. to the last 3 st., k. 2 tog., k. 1; second needle, patt. to the end; third needle, k. 1, k. 2 tog., k. to the end. Rep. these two rounds until 64 st. remain. Next round: K. 16, patt. 32, k. 16. Rep. this round until the work measures 9in. from the back of the heel, finishing at the end of the third needle.

Shaping the Toe

First round: First needle, k. to the last 3 st., k. 2 tog., k. 1. Second needle, k. 1, sl. 1, k. 1, p.s.s.o., k. to the last 3 st., k. 2 tog., k. 1. Third needle, k. 1, sl. 1, k. 1, p.s.s.o., k. to the end. Second round: K. to the end. Rep. these 2 rounds until 20 st. remain, slip the st. from the first needle on to the third needle. Place the two sets of st. together and graft them.

DRESS PLACKETS

NOTHING betrays the amateur dressmaker more than a poorly made placket. Yet it is not difficult to learn to make an inconspicuous placket which will remain neat and last for the life of the garment, and in this article Edith G. McNab, Rural Sociologist, Department of Agriculture, Timaru, explains how the work should be done.

PLACKETS are used in fitted garments to provide for easy putting on and taking off; they are found at the waist, at the wrists of fitted sleeves, or at the neck, whenever the style requires one. For present fashions, most dresses and skirts require a placket at the waist. As such plackets are seldom used as decorative features, it is important to be able to make them so that they do not detract from the appearance of the garment. A finished placket should be flat and smooth with no bulges and it should not gape when the garment is worn. This means that the width and length of the placket and the number of fastenings should be suited to the purpose for which it is used. Plackets should not be made any longer than necessary. They are frequently made in seams and sometimes under pleats or tucks.

Choice of a method of making a placket depends on the type and design of the garment, the weight of the material, the situation of the placket, and the kind of fasteners to be used. Common mistakes are to make the facing or under-lap of the placket wider than necessary, using too few fasteners, which results in gaping, using unsuitable fasteners, or sewing on the fastenings incorrectly. For durability, good finishing of the ends of the placket and secure sewing on of the fastenings are important.

Slide fasteners are excellent for plackets provided they are not too heavy for the fabric of the garment. Snap fasteners or domes are suitable only for use in plackets or parts of plackets where no strain comes. For side plackets in dresses or skirts there should be at least one or two hooks at waist level if snap fasteners are to be used for the rest. For garments to be worn when taking part in sports or other physical activity hooks are better than domes, which may give way during vigorous movement or if the garment catches on an obstruction. In choosing hooks or domes buy the smaller sizes for use on light-weight fabrics. For sheer fabrics hooks are better than domes, for there is then no tendency to open them by pulling the fabric.

Sewing on Fastenings

The sewing on of fastenings was described in an article on page 287 of the September, 1949, issue of the "Journal". For plackets it is particularly important that hooks have a few stitches taken over the hooked end so that the hook will not lift up from the material. For durability stitch domes or hooks on by buttonholing them. The stitches attaching the fastenings should not appear on the right side of the garment, nor should rounded eyes be used when closing plackets by hooks, as they are difficult to conceal. If straight eyes cannot be obtained, make buttonholed bars. Both hooks and domes should be sewn on so that their outer parts are about ⅛in. back from the edge of the upper part of the placket, because then they are out of sight when the placket is closed. Fastenings may need to be as close as 1¼in. apart to prevent gaping in very snugly fitting garments.

[*New Zealand Wool Board photo.*

It is customary to lap right side over left or front over back for plackets in women's garments, for men's clothing closings are lapped left over right. These are not hard-and-fast rules and need not be followed if the style demands different treatment.

Length of Openings

An opening should not be made any longer than is necessary. For a waist placket the length can be found approximately by taking half the difference between the measurements round the shoulders and the waist and adding 1in. for ease; or the best length may be found by trying on the garment. For a sleeve placket it may be desirable if the garment is to be laundered frequently, to have the opening long enough to open the wrist-band out flat for ironing. The finished width of side plackets varies from ½ to ¾in.; use the narrower finish when suitable. The width for sleeve plackets may be up to ¼in. For strength, extension pieces and facings are cut out on the straight grain.

Continuous Bound and Faced Placket

A continuous bound and faced placket may be made in a seam or in a slash. It is described and illustrated as made in a slash, as it is easy to adapt the method for use in a seam. This placket is useful for garments which do not have seams at the side, such as women's pyjamas and panties or skirts which do not have a side seam. For such garments the top would be finished by a band after the placket is made.

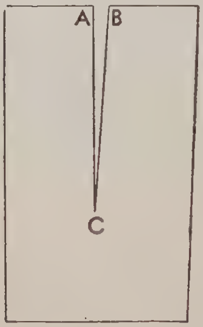


Fig. 1—The placket is shown made in a slash. It may also be made in a seam. The garment is cut on the straight grain for the required length. Three points are lettered so that their relative positions are easily found in the following three diagrams.

The fabric is cut in the correct position and for the required length on the straight grain (Fig. 1). Slashing on the straight grain is essential for strength and to avoid stretching, which would produce a buckled placket. A strip for binding is cut, also on the straight grain, twice as long as the placket plus 1in. The strip should be twice the width of the finished binding plus two seam allowances of up to ⅜in. The strip will usually be about 2in. wide. Baste the strip to the slash, placing right sides together and keeping the seam allowance the same width for the whole length of the strip but tapering the allowance on the garment to a point at the end of the slash by moving the edge of the slash gradually back from the edge of the strip, from about 1½ to 2in. from the end of the slash (Fig. 2). Machine stitch the seam, with the garment uppermost, sewing to a point at the end of the slash; then with the needle in the fabric lift the presser foot and gently pivot the garment round the needle. See that the strip underneath is flat and straight before lowering the foot and continuing to sew. If the seam allowance on the garment is not reduced to nothing at the end of the slash, there will be a wrinkle or pleat in the garment at the end of the placket.

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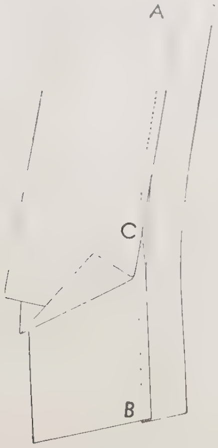

Fig. 2—The strip of fabric has been joined on and one side of the opening brought down so that the uniform seam allowance of the strip and the narrowing of the allowance to nothing at the end of the slash in the garment are seen. This is the side which is uppermost during sewing of the seam.

The seam is pressed toward the binding and the raw edge of the binding is turned in. The binding is next folded in halves so that the turned edge just comes to the seam line on the back of the garment. It is hand stitched into position, taking each stitch under a machine stitch, into the seam allowance, and up through the folded edge. The half of the strip joined to the front of the slash is trimmed to within ⅛ to ⅜in. of the centre fold and to ⅜ or ½in. of the bottom of the slash (Fig. 3). This half of the strip is then folded back to the wrong side of the garment to form a facing for the front of the placket (Fig. 4). The fold must be such that the seam joining the strip is not seen from the right side of the garment. The facing is slip stitched in place by hand. After the top of the garment has been finished by a waistband or a facing of petersham ribbon the fastenings may be sewn on the placket. Put them on the upper side of the closing first, close the placket accurately, and mark the positions for the fastenings on the upper lap.

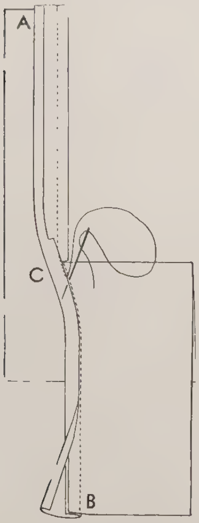

Fig. 3—At this stage the binding has had its raw edge turned in, the strip has been folded in halves so that the edge of the binding comes just to the back seam line, and the facing has been trimmed off to within ¼in. of the centre fold. The binding is being hand stitched into position.

To make this kind of placket in a seam, clip the seam allowance almost to the stitching at the point where the end of the placket will come and proceed as described, but stitch the strip exactly on the seam line and keep an even seam allowance on both garment and strip for the whole length of the placket. When the binding and facing are in position the placket should appear as a continuation of the seam. If this placket is made in a dress seam, the top of the placket should be finished by closing it and stitching the binding and facing together across the top of it, making sure the stitches do not show on the right side of the garment. If a machine is used for this stitching, hold the two ends of the strip together and fold the garment back out of the way so that no stitching goes through the garment.

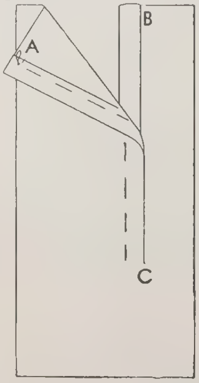

Fig. 4—The binding has ben stitched into place and the facing is basted into position, ready for hemming. When closed the front faced part of the placket laps over the binding on the back edge.

Bound and Faced Plackets

Bound and faced plackets are made in seams and frequently are used for underarm dress plackets. The seam lines on the back and front of the opening are marked with lines of basting (Fig. 5). An extension piece is cut for binding the back of the placket, allowing twice the width of the finished extension plus two seam allowances, and cutting it 1½in. longer than the opening, to leave ¾in. free at each end. Sometimes the extension and the back of the garment are cut in one piece. For a ½in. finished binding and ¼in. seam allowances the width of the strip would be 1½in. Another piece is cut for the front facing, the width being that of the finished facing plus two seam allowances. For a ½in. facing and ¼in. seam allowances the strip would be 1in. wide.

Clip the seam allowances on the garment almost to the stitching at each end of the placket. The extension strip is placed against the raw edge of the placket on the back of the garment, right sides together, and basted into position, leaving the ¾in. pieces free at each end. If the seam at the waist of the garment is a plain one, the ends of this seam may be pressed open before crossing them with the seams joining on the strips. In machine stitching the extension strip on have the garment next the presser foot and sew exactly on the line marked. Begin and end the stitching where the stitching of the garment seams end at the top and bottom of the opening. Fasten the ends of threads securely. Press the seam toward the extension and trim the seam allowances if necessary to about ¼in.

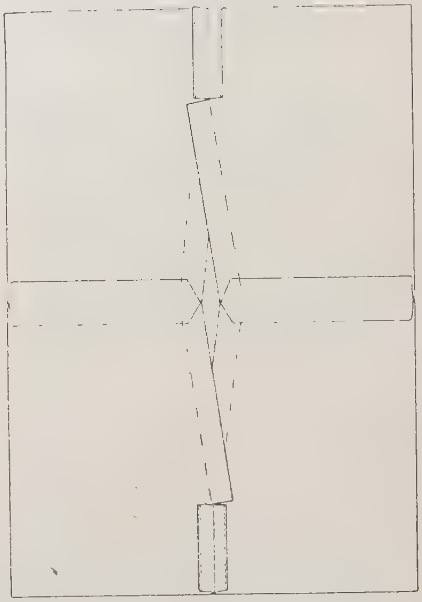

Fig. 5—The opening prepared for sewing on the binding and facing. Notice the line of basting marking the position of the seams and the waist seams pressed open where they will be crossed by the join. The seam allowances have been clipped at each end of the placket.

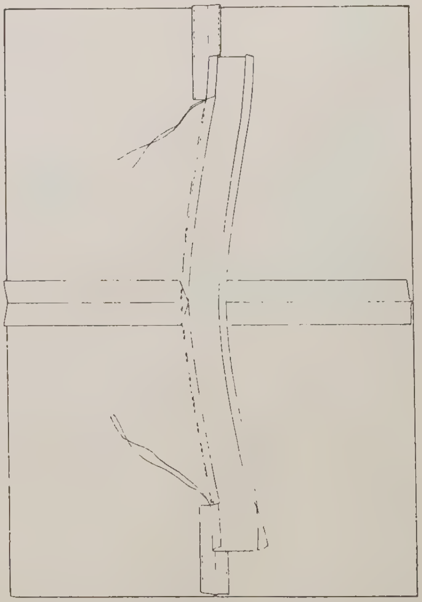

Fig. 6—The binding attached and brought through to the wrong side of the garment. The seam allowances have been trimmed off. Note the machining on the line marked by the basting, the diagonal clipping of the ends of the waist seam to reduce bulk where the joins cross, and the ends of the thread brought to the same side for tying. The edge of the binding is turned ready for folding over to the seam line and hand stitching in position.

in width. Turn the raw edge of the binding, fold it lengthwise through its centre, bring it through to the wrong side of the garment (Fig. 6), and baste the turned edge exactly over the line of machine stitching. Hand sew the edge to the garment.

The facing is attached to the front of the opening in a similar way, brought through to the wrong side, and folded back at the marked seam line on to the garment so that the join is just out of sight from the right side. The edge is turned in and basted to the garment (Fig. 7). Blind hemming or slip stitching may be used to finish the facing. If the hemming cannot be done invisibly, the edge may be turned and machine stitched instead of being sewn to the garment, or a selvedge strip may be used for a facing.

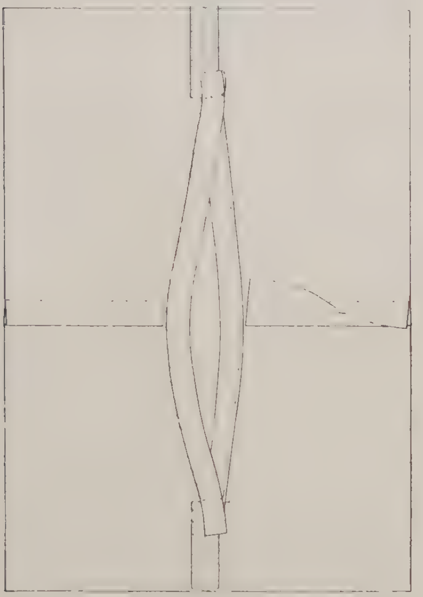

Fig. 7—The binding finished and the facing basted in position ready for hemming. Note the stitching across the ends of the binding and facing and the clipping of the waist seam allowances so that both allowances may turn downward.

Pin the placket closed so that the ends of the facing and binding may be accurately brought together, and, holding the ends free of the garment, machine or back stitch across them to hold them together securely. Overcast the raw edges of the ends of the strips. The placket is then ready to have the fastenings sewn on, following the same procedure as for the first placket. If the waist seams have been pressed open, the upper seam allowance should be clipped so that it may be turned down on to the skirt. Remove all basting threads when the placket is finished.

Plackets Using Slide Fasteners

Fastener concealed and the finished placket appearing like a slot seam: The slide fastener should not be too heavy for the fabric of the garment. If possible, buy a fastener which is closed at both ends for dress plackets. For skirt plackets the fastener should have one end open. For a dress placket the fastener should be a little shorter than the length of the opening. An edge sewer or cording foot is useful when sewing on slide fasteners, because the stitching may be made closer to the metal.

The seam allowances at the opening are turned under, pressed, and basted. The slide fastener is pinned to the opening, with the slider at the top. Lap each turned edge over to the centre of the fastener so that the two meet in the centre and hide the fastener completely. Ease the garment slightly on to the tape by holding the garment on top of and slightly more loosely than the tape (Fig. 8). Baste, then machine stitch, keeping the stitching an even distance from the edges and about ¼in. away from them. Carry the stitching across the bottom of the placket at right angles, but if it is necessary to allow room at the top for the slider when the placket is closed, widen the distance from the edges to form a triangle with its base at right angles to the seam line at the extreme top of the placket. Do not make the rows of stitching so close to the metal of the fastener that it is difficult to run the slider up and down. Finish the ends of the tape with overcasting to prevent fraying. Do not cut the ends of the tape off short.

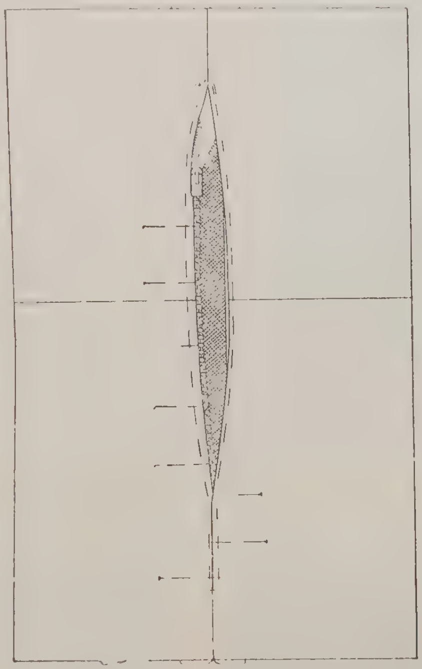

Fig. 8—The seam allowances have been turned under, pressed, and basted in position. One side of the opening is pinned to the tape, lapping the folded edge over to the centre of the fastener. At the bottom of the placket, where the other side is pinned, note that the folded edges meet. After basting, the placket is machine stitched about ¼in. away from each edge.

Fastener concealed under one fold: Mark the seam lines with rows of basting thread on both sides of the placket as in Fig. 5. Turn under the back edge from 1/16 to ⅛in. from marked line and press and baste it. Cut a facing for the front edge 2in. longer than the opening and about 1½in. wide. If it is cut on the selvedge, the free edge will require no finishing. (A raw edge may be turned in and stitched close to the turning, but even though this is not stitched to the garment, it is more likely to be obvious than a selvedge edge.)

Join the facing strip to the front edge, right sides and raw edges together. Sew from the wrong side of the garment so that the marked line can be seen. By stitching slightly outside the line the facing will be invisible from the right side when brought through to the wrong side and the material folded on the marked line. Press the seam toward the facing and press in the fold. Baste the facing in position.

Baste the fastener tape to the back of the placket, easing the fabric slightly on to the tape and lapping the folded edge almost to the edge of the metal. Machine stitch close to the folded edge with the edge sewer or cording foot (Fig. 9). Close the slide fastener and baste the placket closed, lapping front over back to match the two marked lines exactly. From the right side, stitch the front of the placket to the tape, beginning by stitching diagonally across the top of the placket from the seam line

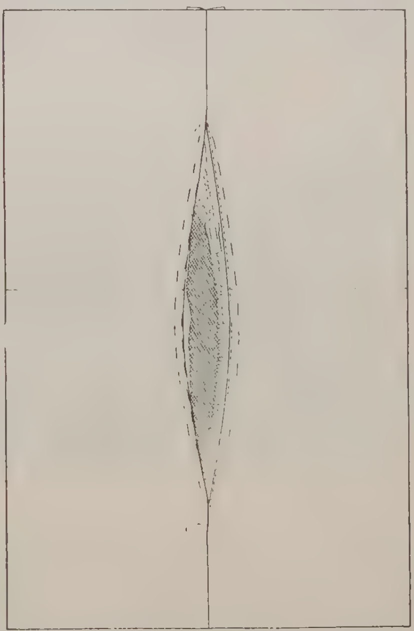

Fig. 9—The seam lines have been marked with basting. The front of the placket has been faced and turned under on the marked seam line. A second line of basting holds the facing in place. The back edge has been turned in about 1/12in. from the marked line and then lapped over the fastener tape nearly to the metal and stitched close to the edge.

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(Fig. 10), turning the corner when about ½in. from the seam line and continuing down parallel to the folded edge, turning again at the bottom to finish it with another diagonal row of stitching to the seam line. Draw the upper ends of the thread through to the wrong side and knot them before cutting them off or run them in out of sight with a needle. If the slider is bulky, and especially if no cording foot is available, it may be necessary to move the slider out of the way during stitching. Do this by raising the presser foot with the needle in the material, move the slider carefully along the fastener, lower the foot, making sure the material has not been turned at all, and continue stitching.

Skirt plackets using slide fasteners are finished with a waistband in the usual way, using a button or one or two hooks to fasten the band at the top of the placket. It is not advisable to bring a slide fastener right to the top of the band too unless it has a satisfactory locking device which will prevent accidental opening.

Guard under slide fastener: If a guard is needed under the slide fastener to prevent it catching on undergarments (or perhaps on skin), it may be made of a double strip of fabric, about 2in. wide, and 1½in. longer than the placket. Fold the strip in two (if the upper edge is a selvedge, no finishing of the edges will be required) and stitch the two edges to the back edge of the fastener tape. Stitch also to the ends of the tape with the garment folded back out of the way.

Plackets in Thick Material

When making plackets in thick material reduce the bulk by facing the extension with silk fabric which matches the heavy material in colour and make the facing of silk also. Tape or strong ribbon may be used instead of silk and has the advantage that the edges require no finishing or turning under. For medium-weight materials trim the seams so that they are not quite the same width before turning the facing extension to the wrong side. This reduces the likelihood of a ridge showing through to the right side at the edge of the seam allowances.

Sleeve Plackets

Sleeve plackets may be made as described for a bound and faced placket, the width of binding and facing being kept narrower, in scale with the shorter opening. Alternatively, a short slide fastener as described or exposed fastener may be used, or a placket may be made in the seam allowances.

Sleeve placket in seam allowances: A hem is made in the seam allowance of the upper edge of the placket. The turnings are made so that the second fold comes exactly on the seam line and the hem is not more than ¼in. wide. The hem is hand stitched. The turnings in the underside are made so that the second one comes ¼in. from the seam line into the allowance, thus forming a ¼in. underlap; the hem is best made slightly narrower so that any signs of stitching are hidden when the placket is closed. The seam allowance on the underlap side will need to be clipped at the end of the placket so that the underlap will lie flat and in the right direction. Any raw edges at the end of the placket should be overcast to prevent fraying.

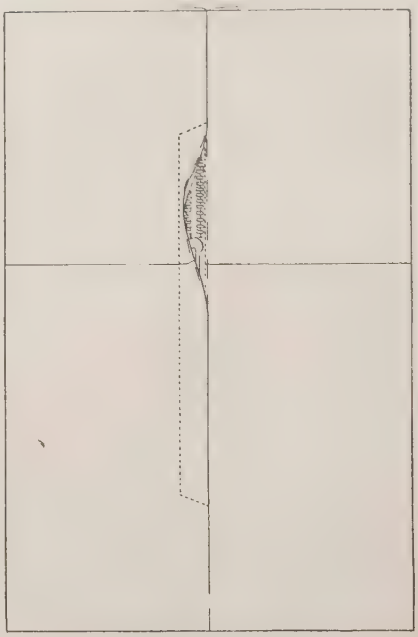

Fig. 10—The placket is finished except for removing the bastings marking the seam lines. When the placket is closed these two lines fall one on top of the other.

Testing Jelly Mixture for Pectin

SUCCESS in jelly making depends on the proportions of acids, pectin, and sugar in the mixture being right. Acidity must be judged by taste, but testing for pectin is easy. Here is the method:—

Take 1 tablespoon of the juice which has been extracted from the fruit and add 1 tablespoon of methylated spirit. If this mixture sets to a clotted jelly, the juice is very rich in pectin, and an equal quantity of sugar may be added to the juice to make jelly. If the mixture becomes cloudy and thickens a little, but does not jell, less sugar should be used—say, ¾ cup to 1 cup of juice. If the mixture becomes cloudy, but does not thicken at all, the juice contains little pectin, and only ½ cup of sugar should be used to each cup of juice.

—*EDITH G. McNAB, Rural Sociologist, Department of Agriculture, Timaru.*

The mixture of juice and methylated spirit has jelled, showing that the juice is rich in pectin and will make satisfactory jelly with an equal quantity of sugar.

CHEESE...

A Valuable Food which Can Be Used in a Multitude of Ways

MOST New Zealanders, and certainly most dairy farmers, realise something of the great value of milk in the human diet, though whether they consume adequate amounts is questionable. Probably many fewer people realise the value of cheese, which contains in a far more concentrated form most of the important nutrients from the milk. It is especially valuable for the calcium or lime it contains; in fact, New Zealanders have no appreciable sources of calcium available to them in their ordinary diet other than milk and cheese. The food value of cheese and ways of using it in the menu are described in this article by Eirene E. Unwin, Rural Sociologist, Department of Agriculture, Dunedin.

NEW ZEALAND is low in the list of cheese-eating countries. In 1948 Denmark headed the list with an average consumption of 18.5lb. per head per year. The United Kingdom, with cheese rationing still in effect, was fifth in the list with 8.5lb., and New Zealand was lower still with 6.4lb. per head per year—between ¼ and 1/3oz. per head per day, or not quite 2oz. per week. Probably because of meat rationing, the annual figure rose during the war, but only to 7.5lb. per head, or 1/3oz. each per day and this slight increase was not sustained.

Nutritive Value of Cheese

The League of Nations dietary recommendation is 1oz. of cheese daily for adults and up to 3oz. for adolescents as an alternative to meat or fish, and even for 7-year-olds 1½oz. daily as a similar alternative. Obviously cheese is considered important and its value is shown by the fact that this daily adult allowance of 1oz. provides 12 per cent. of the average daily requirement of protein, 37 per cent. of the calcium needed, 21 per cent. of the phosphorus, and 54 per cent. of the vitamin A. These nutrients all come from the milk from which the cheese is made, but they are in a more concentrated form than in the milk, as the following table shows in approximate average figures:—

COMPOSITION OF MILK AND CHEESE

	Milk (per cent.)	New Zealand Cheddar (per cent.)
Water	87	34
Fat	4	37
Sugar	5	Traces
Protein	3.3	25
Minerals	.7	4 (including added salt)
Calcium (included in minerals) ..	.118	.93

The percentages of constituents of milk which go into the cheese made from it are: Water 5, fat 92, minerals 40, protein (casein and albumen) 95 and 5 respectively, and sugar 5. The other 95 per cent. of the water is lost in whey, which also contains nearly all the sugar, the albumen (the soluble part of the protein), and the soluble minerals.

Above all, the calcium content makes cheese so important a food. The League of Nations recommendation of 1¾ pints of milk a day provides the whole daily requirement of calcium, but as few New Zealanders drink nearly this quantity, it is very important that they realise that cheese is the only other food commonly available which also provides an appreciable amount. An average serving of cheese (2/3oz.) contains about as much calcium as 1 large cupful of milk (7oz.).

Calcium, or lime as it is often called, is essential for the proper formation of strong bones and teeth, and though this is not the only factor affecting dental health, the teeth of most New Zealanders would probably be a great deal better if they ate more cheese or drank more milk, or did both.

[Sparrow Industrial Pictures Ltd. photo.

Cooking Cheese

Because cheese is so concentrated, it is a comparatively cheap food, and the wise housewife will include it in her daily menus whenever possible. It is tasty raw or cooked and very simple to use; in fact, there is only one rule to remember when cooking it, and that is that cheese should not be overheated.

The chief aim in cooking cheese is to melt the fat so that it may blend smoothly with the rest of the mixture. A secondary aim, especially for dishes topped with cheese, is to "toast" it to improve the flavour and appearance of the dish. Both cooking and toasting need only a comparatively short time and not too high a temperature. If cheese is overcooked, the protein in it becomes tough, and if the high temperature is maintained for too long, it becomes uneatable. Therefore cheese should almost always be mixed with already-cooked foods, or with raw ones only if they need nothing more than just heating through.

Types of Cheese

There is very little variety of cheese available in New Zealand. By far the most common is Cheddar, usually sold in two or three strengths—mild, medium, and tasty—the variations being mainly the result of the length of time for which the cheese has been allowed to mature. Because longer maturing involves storage in special curing rooms with control of temperature and moisture, the tasty cheese is more expensive, but because it has a much stronger flavour less need be used in cooking to give a marked cheesy flavour. The strength of the cheese is not given in the recipes which follow, and both the strength and the amount can be varied according to individual taste.

Practically the only other varieties of cheese available in New Zealand are processed cheeses and cheese spreads. These are made from ordinary Cheddar, but are reworked; that is, the cheese is minced, cooked, or melted, salts may

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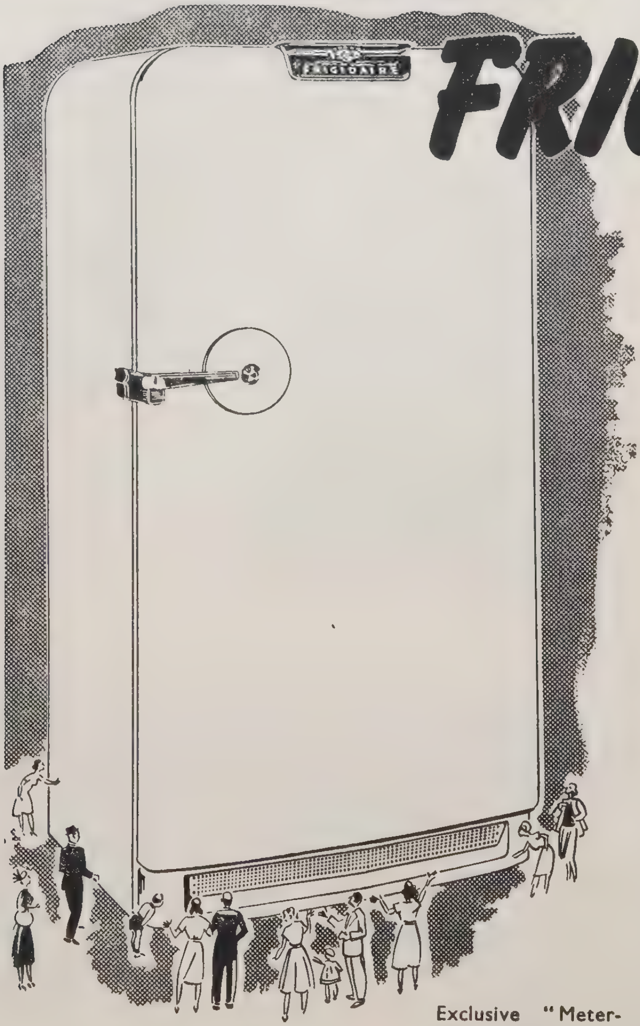

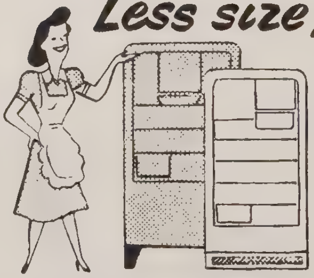

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be added to keep the fat from separating, flavourings are added, and the mixture is poured into wrapper-lined moulds or tins to cool and set. All or almost all these processed cheeses are pasteurised; that is, during their preparation they are raised to a temperature high enough to kill harmful bacteria which might be present. Their flavour and consistency depend mainly on the maturity of the cheese used, on the flavour added, and on the temperature at which they are cooked.

Storing Cheese

Freshly bought cheese is soft and moist, but when it is kept it tends to dry out very quickly, particularly in hot weather, and frequently it goes mouldy. The mould is not harmful, and cheese streaked with green can be used safely, though for eating raw its apppearance is spoilt. Cheese should be kept wrapped in sterile cheese cloth, or a freshly ironed light cotton cloth, in a covered dish in a refrigerator. If possible it should be kept at a temperature not higher than 45 degrees F., so if no refrigerator is available, as cool a place as possible should be chosen.

In really dry weather cheese keeps better if the cloth is sprinkled with vinegar, dipped in water, and wrung out before the cheese is wrapped in it. If the cloth dries out, it should be wetted again with the vinegar and water.

Wrapping cheese in wax paper helps prevent its smell from spreading through the refrigerator.

Grated cheese may be kept in a jar on a shelf or in the refrigerator.

Measurements

An 8oz. measuring cup of grated cheese weighs about 4oz.

An 8oz. measuring cup of sifted flour weighs about 4oz.

If an 8oz. measuring cup is dipped into the flour bin so that flour is packed firm, it contains about 6oz.

An ounce of flour is the equivalent of 4 tablespoons if the flour is stirred or sifted, but barely 3 tablespoons if it is packed firm.

White Sauce

Here is the method for making the white sauce used in many of the recipes which follow:—

Melt the fat, stir in the flour carefully, and cook and stir them until they are smooth. Add the liquid, hot or cold, a little at a time, and stir the mixture until it is smooth and boiling after each addition. When all the liquid is in, cook the sauce for a minute or two after it has boiled, stirring all the time.

If grated cheese is to be added, remove the sauce from the heat and stir the cheese. If the cheese cools the sauce too much, cook it for a moment or two longer, but usually all the cheese melts without extra cooking if it is stirred into the hot sauce.

If the sauce is overcooked, the cheese will become tough and separate out from the sauce again.

Recipes

Milk and Cheese Soup

½ pint of milk
½oz. of butter or good dripping
½oz. of flour
2 tablespoons of grated cheese (about ¼ cup)
Pepper and salt

Allow these quantities for each person.

Make a white sauce with the fat, flour, and milk. Remove it from the heat and stir in the grated cheese, salt, and pepper to taste. Allow the cheese to melt, but do not cook it any more. Serve the soup with fried croutons of bread.

Vegetable stock or vegetable puree may be used in place of some of the milk.

Cheese Bread Custard

½ cup of breadcrumbs
2 eggs
1 cup of milk
½ cup of grated cheese
Salt and pepper

Put the crumbs and cheese in a greased pie dish. Add salt and pepper and pour over them the beaten eggs mixed with the milk. Bake the custard in a slow oven or in a pan of water until it is set.

A more economical dish may be made by omitting 1 egg and increasing the crumbs to 1 cup. The cheese can also be increased up to 1 cup. To be sure the bread is well soaked beat it into the egg-and-milk mixture and finally stir in the cheese. Cook them in a greased dish as in the first recipe. More flavour may be added with chopped bacon or ham, chopped fried onion, parsley, chives, or tomato.

Cheese Loaf

½lb. of cheese (2 cupfuls grated)
2 cups of crumbs
½lb. of boiled ham
2 cups of milk
Salt and pepper

Line a greased dish with crumbs, then arrange layers of cheese and minced ham alternately with crumbs. Season the mixture well with salt and pepper and pour milk over it. Allow it to stand for 5 minutes, then bake it for 20 minutes in a moderate oven. Serve the loaf with tomato sauce.

Potatoes au Gratin

1½lb. of cooked potatoes
1 hard-boiled egg
4oz. of grated cheese
1oz. of flour
Crumbs
1oz. of butter or good dripping (2 tablespoons)
1 pint of milk
Pepper and salt

Cut the potatoes into fairly thick slices and put them in a greased ovenware dish with the sliced egg. Make a white sauce with the fat, flour, and milk, and when it is cooked stir in three-quarters of the cheese and the salt and pepper. Pour this over the egg-and-potato mixture. Mix the crumbs with a little melted dripping and the rest of the cheese and sprinkle them over the top. Bake the dish until it is hot through and browned.

Vegetables au gratin: Instead of the potato and egg almost any cooked vegetable or a mixture of several may be used with a cheese sauce to make delicious tea or luncheon dishes. Onions, celery, leeks, white turnips, cauliflower, artichokes, cabbage, or brussels sprouts are all suitable.

Other au gratin dishes: The same recipe may be used for macaroni cheese or for creamed fish and cheese. Mix the cooked flaked fish with the sauce, and add some chopped parsley and, if desired, cooked potatoes before putting it into the greased dish and sprinkling it with crumbs.

Egg-and-spaghetti Cheese

¼lb. of spaghetti
2 hard-boiled eggs
½ pint of white sauce (2 tablespoons each of fat and flour)
¼lb. of grated cheese
2 tablespoons of breadcrumbs
Salt and pepper

CHEESE LOAF

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Cook the spaghetti until it is tender, drain it, and use the water to make the white sauce, adding milk if necessary to make up the ½ pint, and seasoning it well with salt and pepper. Slice the eggs. Put the spaghetti, egg, cheese, and sauce in layers in a greased ovenware dish, keeping sufficient sauce to coat the top. Mix soft crumbs with a little melted dripping and grated cheese and sprinkle them on top. Bake the dish until it is hot through and brown on top.

Brown Rice and Cheese

3oz. of brown rice (or spaghetti or macaroni if rice is not obtainable)
1oz. of butter
4oz. (1 cup) of grated cheese
2 tablespoons of flour
1 cup of milk
Salt, pepper, mustard

Cook the rice in boiling salted water for 25 minutes, then drain and dry it. Meanwhile make a sauce from the butter, flour, milk, and seasoning and add the cheese. Mix the sauce with the rice and serve it at once.

Bean, Rice, and Cheese Pudding

½ cup of brown rice
1½ pints of skimmed milk or stock
4oz. (1 cup) of grated cheese
8oz. of beans
3 tablespoons of dripping
Salt and pepper
Crumbs

Cook the rice in the milk or stock. Add the seasoning, beans (previously soaked and cooked), grated cheese, and half the fat. Melt the rest of the fat and mix it thoroughly with soft breadcrumbs. Turn the rice mixture into a greased bowl, sprinkle the fatty crumbs over the top, and brown the pudding in a moderate oven. Grated cheese may also be mixed with the crumbs.

Apple-and-onion Savoury

Stew together equal quantities of finely sliced onion and an apple that cooks down to a mush. Use as little water as possible so that when cooked the mixture is fairly thick. Then add a generous amount of grated cheese and seasoning to taste. Serve the savoury on toast. It tastes much better than might be expected and is very easy to prepare.

Savoury Cheese Potatoes

Potatoes (1 fairly large one for each serving)
Salt and pepper
1oz. of butter to each 6 potatoes
4oz. of cheese to each 6 potatoes

Boil, drain, and dry the potatoes. Divide each in halves lengthwise, brush the pieces over with melted butter, and sprinkle them with salt, pepper, and grated cheese. Bake them until they are brown.

Cabbage Savoury

1 small cabbage or half a large one
¼lb. of onions
¾lb. of carrots
5oz. of grated cheese
1¼lb. of sausage meat
Parsley
Salt and pepper
1½ cups of breadcrumbs

Slice the onions and fry them in a little dripping. Cook the carrots and cabbage until they are tender, or use left-over vegetables. Arrange the cabbage, sausage meat, cheese, and carrots in layers in a greased oven dish, and add salt and pepper to taste. Cover the mixture with crumbs mixed with melted dripping or butter and bake it in a moderate oven (350 to 375 degrees F.) for 1 hour or until the crumbs are browned.

CHEESE RECIPES

CAULIFLOWER AND CHEESE SAUCE

[*Campbell Photography photo.*

Cheese Potatoes

6 to 8 potatoes
1oz. of dripping or butter
2oz. of grated cheese
¼ pint of milk
Salt and pepper

Cook the potatoes, mash them smoothly, and to them add the salt, pepper, milk, butter, and most of the grated cheese. Mix them well and put them in a greased ovenware dish. Sprinkle the remaining cheese over the top, and cook the mixture until it is heated through and brown on top.

A richer mixture may be made by using beaten egg instead of the milk.

Welsh Rarebit

1 cup of milk
2 tablespoons of flour
1 cup of grated cheese
Salt and pepper
1 egg (can be omitted)

Make a sauce from the milk and flour, and add the salt, pepper, beaten egg, and grated cheese. Stir the mixture until the cheese is melted and serve it on toast or fried bread.

This recipe may be varied by omitting the flour, reducing the milk to 2 tablespoonfuls, and adding ½oz, of butter and 1 teaspoon of mixed mustard. Melt the butter, add the cheese, and stir until it is melted, then add the milk gradually, and finally the seasoning.

Cheese Toast

Make slices of toast, fairly lightly done on one side. Cover them with slices of cheese on the light side and sprinkle them with salt and pepper. Heat them through under the griller and serve them at once. Do not use too hot a grill or the cheese will be tough.

Here are ways in which this recipe may be varied:—

Grate the cheese and mix it to a paste with a little milk. Season it and spread it thickly on the toast. Grill the toast as before.

Mix the grated cheese with beaten egg, adding a little Worcestershire or tomato sauce, if desired, and salt and pepper. Spread the mixture on thick slices of bread and bake them in a slow oven for about 20 minutes. The crusts tend to become hard, so they may be removed before baking.

Place a small slice of bacon or tomato on the cheese before cooking it.

Cut the bread very thin and in fingers, and serve the first or second variation cold as an afternoon tea or supper savoury. This is especially tasty if the bacon is added.

Cheese Fritters

3oz. of flour (¾ cup sifted or stirred)
1 egg
2oz. (3 tablespoons) of milk
2 tablespoons of melted butter
6oz. of dry cheese
Salt and pepper
Vinegar

Beat the egg yolk with the milk and melted butter. Stir into this the flour mixed with a pinch of salt and beat them well. Beat the egg white stiff and fold it lightly into the batter. Cut the cheese into small strips or fingers, dip them into the vinegar and then into the batter, and slide them gently into a pan containing smoking-hot frying fat. Fry them until they are golden brown on both sides, drain them, and serve them at once.

Cheese Puffs

1 egg
2oz. of grated cheese
2oz. of butter
Salt and pepper
4oz. of flour
2oz. of fat
½ teaspoon of baking powder

For the cheese filling melt the butter in a saucepan and stir in the grated cheese, beaten egg, and seasoning. Cook it over low heat until it resembles scrambled egg, then cool it.

Rub the fat into the seasoned flour and baking powder, mix them with water, and roll them out thinly. Spread half the cheese filling over half the pastry. Fold the other half over and spread the rest of the filling on top. Cut the mixture into fingers and bake them in a quick oven for ¼ hour.

Simplex Potatoes

2lb. of evenly shaped potatoes
2oz. of grated cheese
2 tablespoons of fat
Salt and pepper
Chopped parsley

Peel the potatoes and cut them in rounds ¼in. thick. Brown one side of each round in the fat in a frying pan slowly, with the pan covered. Turn them and sprinkle grated cheese, salt, and pepper on the browned sides.

CHEESE RECIPES

SAVOURY TARTS
CHEESE STRAWS

[*Campbell Photography photo.*

Brown the undersides slowly so that the potatoes will be well done and the cheese melted. Serve them hot.

Potato-cheese Appetisers

3oz. of butter or good dripping
1 cup of grated cheese
½ cup of dry mashed potato
¼ cup of flour
½ teaspoon of mixed mustard
Salt and pepper
2 or 3 drops of Worcestershire sauce

Cream the fat and add first the grated cheese and then the other ingredients. Form the mixture into small balls and bake them at 400 degrees F. for 5 minutes.

Cheese Sandwich Fillings

Any of the following may be mixed with grated cheese for a sandwich filling: Salted nuts, chives or onion, celery, cress, cucumber, chutney, sultanas and grated raw apple, tomato pulp, sultanas and pineapple, lettuce, or hard-boiled egg and parsley.

Cheese Straws

Before mixing short pastry with water stir grated cheese and seasoning into the flour. Then mix the pastry and roll it out in the usual way. Cut it into fingers about ⅜in. wide and 2 to 3in. long. Bake them in a moderate oven for 10 to 12 minutes. Serve them hot or cold.

For a richer mixture use 1 egg yolk to each 3oz. of flour, 1½oz. of butter, lard, or soft fat, and 3oz. of cheese. Season and mix them as before, using the egg yolk in place of all or most of the water.

For dainty serving cut a few rings about 2in. in diameter as well as straws and serve the straws in the rings, as in the illustration on this page.

Cheese Aigrettes

1½oz. of flour (¼ cup, unsifted)
½oz. of butter or dripping
2 small eggs
Salt and pepper
1oz. of grated cheese

Boil the butter in ¼ pint of water. Add the sifted flour and beat the mixture until it forms a ball. Add the cheese, salt, and pepper and beat in the eggs a little at a time. Have the fat barely smoking, and put the mixture into it in small teaspoonfuls. Fry the aigrettes until they are golden brown, drain them, and sprinkle them with finely grated cheese.

Savoury Apple Fritters

2oz. of cheese
1 egg
1 apple
Salt and pepper
1 cup of mashed potatoes

Grate the cheese and apple and mix them with the potato, salt, pepper, and beaten egg. Form into fritters and roll these in crumbs, or dip them in batter, and fry them in hot fat.

Savoury Tarts (1)

Pastry shells
Mashed potato
Grated cheese
Parsley
Salt and pepper

Fill cooked pastry shells with seasoned mashed potato, sprinkle them liberally with grated cheese, and brown them in the oven. Garnish them with parsley and serve them hot.

Savoury Tarts (2)

Pastry shells
1oz. of cheese
1 egg
Salt and pepper
2½oz. of milk (1/3 cup or 4 tablespoons)

Beat the egg and milk with the salt and pepper. Add half the grated cheese and pour the mixture into the cooked pastry shells. Sprinkle the rest of the cheese on top. Bake the tarts in a slow oven until they are are golden brown. Serve them hot or cold.

Cheese Dreams

2 level tablespoons of flour
1 cup of grated cheese
1½ teaspoons of mustard
1 egg
1 cup of milk
Salt and pepper
Pastry to line patty tins (preferably puff)

Beat the egg and mix all the ingredients except the pastry together and cook them until the mixture is thick, stirring all the time. Line patty tins with pastry and fill them with the cooked mixture when it has cooled slightly. Bake them for 10 to 15 minutes in a hot oven and serve them garnished with parsley, or put them aside for reheating.

Skewer Savouries

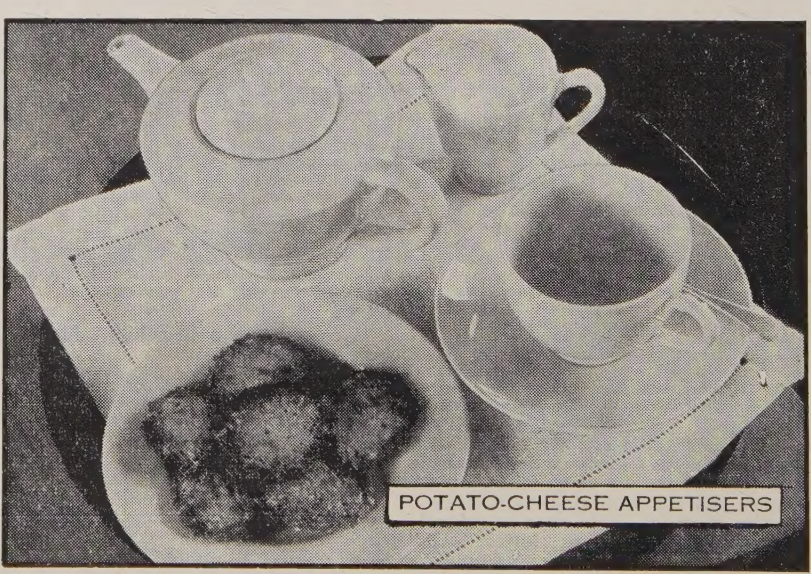
On a wooden toothpick arrange small pieces of apple or sultana, cheese, and luncheon sausage; cherry, pineapple, and cheese; a finger of cheese rolled in cooked bacon; or a prune stuffed with creamed cheese.

Cheese Curls

Run a coarse grater down the side of ½lb. of processed cheese to make thin shavings. Roll them up and use them as a garnish on salad or on water biscuits.

Celery Strips

Wash thoroughly and string some sticks of celery. Choose those that are rounded, so that when cut into short pieces they may be filled with a savoury mixture. Mix finely grated cheese with beaten egg, seasoning, and Worcestershire or tomato sauce and fill the celery sticks with the mixture. Garnish them with parsley, paprika, or cress.



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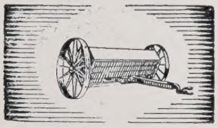

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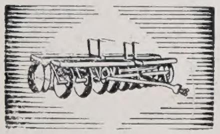

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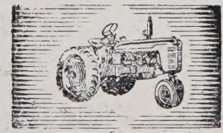

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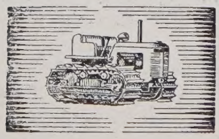

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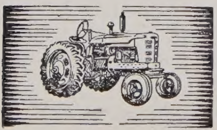

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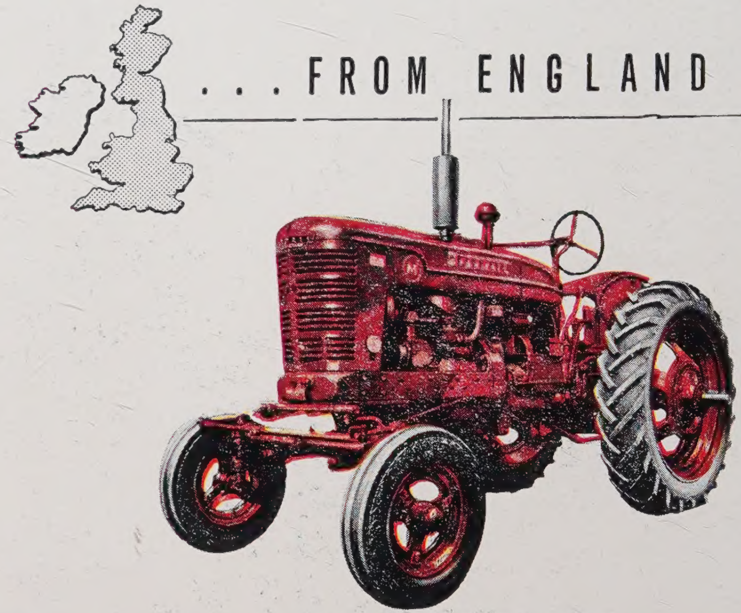

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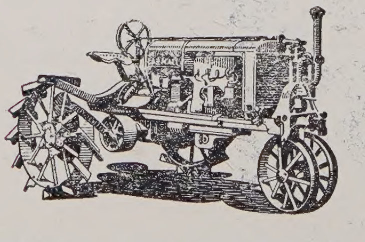

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